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WHY CHEMICAL ENGINEERING ECONOMICS?

PSYCHOLOGISTS tell us that all life can be measured in terms of four mental or emotional hungers that are just as real as those of the physical sort. Recognition, response, security and new experience guide every life, although the balance may vary with different people or at various times in the life of the individual. For most of us, the events of the last few years serve to set apart and emphasize the inevitable conflict between the desires for security and new experience. We become known as conservatives or liberals—or even as Tories or Reds—according to our views of government. We are stand-patters or go-getters in business. We hoard or we gamble with our money. We are one but not the other—notwithstanding the fact that these are times when every decision of life calls for a considerate, open-minded balancing of values.

All around us the one dominant characteristic of the economic and social scene is the element of novelty. "New" may well be the watchword for 1934. It applies to nearly every concept of government and business. We are in a period of experimentation, when many things will be tried and although most of them will inevitably fail, we will make progress if we learn as we go. On the other hand, prejudices, preconceived notions and discounted results can lead only to the end of experiment and back to where we started months ago.

Even though most of the progress in science has resulted from experiment, we chemists and engineers as a class are among the last to want to see experimental methods applied in the economic and social world about us. Our training, if any in subjects other than science and mathematics, has been in the classical schools of economics and history where *laissez-faire* and dog-eat-dog individualism were the reigning doctrines. Our interest in sociology and economics may have ended with these school-day theories. Now comes the time when other things are more important than material achievements. Witness this challenge to engineers made by Secretary of Agriculture Wallace at the recent meeting of the A.A.A.S. in Boston:

> *Trouble, if it comes, will not be in the inability of scientists and technologists to understand and exploit nature, but in the inability of man to understand man and to call out the best that is in him. In solving this limitation the scientists and engineers have all-too-often been a handicap rather than a help. They have turned loose upon the world new productive power without regard to the social implications * * * Science and engineering will destroy themselves and the civilization of which they are a part unless there is built up a consciousness which is as real and definite in meeting social problems as the engineer displays when he builds a bridge. The economist and the sociologist have not yet created this definite reality in their approach. Can you, trained in engineering and science, help in giving this thought a definite body?*

No better statement than this can be made of the purpose that has underlain these annual economic numbers of *Chem. & Met.*, of which this is the eleventh in the series. A balance of economics and technology is just as important in the make-up of the chemical engineer as is the interplay of fundamental forces that determine what he will get out of his own life. The greatest contribution to society as a whole will come from a true understanding of the part that a creative technology can play in balancing scientific production with human needs.

IN CHEMICAL

PROPHETS were fewer than usual at the turn of the New Year despite the fleeting glimpse of real profits to be seen occasionally through the maze of the New Deal. But even if the way ahead has not been charted in the customary manner, certain trends are evident that are surely to become more important to chemical engineers and to the process industries during 1934. A new yardstick is going to be used to measure industrial achievement. Social value, quite as much as the economic service and the profit possibilities, will govern the public's appraisal of industrial accomplishment. In line with this new social concept, the emphasis will likely shift even more to those intangible phases of management and industry which offer the chemical engineer a real challenge and opportunity.

Chemical engineering faces new responsibilities that have come to it with its more recent recognition as a definite part of the engineering profession. Colleagues in the older fields have invited chemical engineers to join with them in fundamental studies of the problems that are common to the entire profession. These have to do with the selection and training of students, their guidance and direction immediately after graduation and, finally, their certification to professional status. These may, at the moment, seem abstract and of little practical interest. Yet they mark the beginning of the first comprehensive approach toward objectives which all chemical engineers recognize as most important.

Industrial Decentralization

JUST PRIOR to the depression, certain powerful economic forces were gradually bringing about a decentralization of industry. Competitive bidding for labor in the congested industrial centers and the rising costs of transportation and distribution made it desirable to move plants nearer to markets or raw materials. In chemical industry that trend was largely in the direction of the South and the Southwest. It, too, was interrupted by the involuntary moratorium on new construction in 1932, but in the year just ended there was convincing evidence of a revival. Two large projects already under way and a third in immediate prospect will supply the Gulf Coast with a nucleus for heavy chemical development. This in turn, is certain to attract chemical consuming industries, many of which are sorely needed in this rapidly growing section of the country.

Another factor that will shortly contribute to industrial migration is the promise of cheap power. Through governmental, and in certain cases through private enterprise, tremendous quantities of additional hydroelectric power and some additional steam-electric power are certain to become available during the next few years. These developments will virtually flood certain great areas of the United States with new energy supplies, roughly estimated to be not less than 5,000,000 and perhaps as much as 10,000,000 additional continuous horsepower. One of three consequences must follow. Much power will be wasted; or tremendous new household uses must be developed; or large new electricity-using industry must be created. It is likely that all three effects will occur simultaneously. The results cannot help but be of importance to a considerable number of electrochemical and electrometallurgical industries.

Capital Goods Revival

CONTINUING EMPHASIS on new products is also helping to bring back the needed balance in the capital goods industries, which have so far been the laggards in the recovery movement. New plants, new equipment, new transportation and distribution facilities, all call for expenditures of capital as well as of chemical engineering activity and ingenuity. The swing to new processes is further stimulated by codes that place a premium on the technical efficiency that comes from continuous operations, automatic control and cost-cutting equipment. The greatest possible impetus to recovery in the capital goods industries is the return of confidence on the part of management and the sound business conviction that money can be profitably spent in industrial rehabilitation. Once that is recognized, business men and investors will find the means to break the dam that for the past three years has held up the stream of new securities and industrial investments. As a matter of fact, several of the principal new issues of recent months have been for the financing of chemical projects and we should not lose sight of the fact that many of the larger companies already have substantial reserves that were set aside for just this purpose—once the way is clear to go ahead. We feel that 1934 is going to see a lot accomplished in this direction.

Editorial Plans

WITH SUCH A LOOK at professional and industrial prospects in the field of chemical engineering, perhaps it is not inappropriate to draw back the editorial curtains for a brief look at "what's ahead in *Chem. & Met.*"?

ENGINEERING AND IN

We shall continue to have a genuine—because it is a natural and selfish—interest in the chemical engineer. We shall want to reflect, interpret and evaluate the trends and developments that affect his economic, industrial and professional well-being. Without sacrificing timeliness and news values, we want to enhance the permanent and reference value of *Chem. & Met.* Every chemical engineer of our acquaintance has a notebook, card index or data file of current developments built to his own specification of usefulness. From time to time a number of contributions to such a chemical engineering file will be introduced in this magazine during the coming year.

With this issue in which we attempt to appraise, in proper chemical engineering perspective, the many new factors affecting industry and government, there is included the first of our data sheets for 1934. This editorial supplement brings together recent statistics of production, imports and prices, as well as verified lists of the manufacturers of the principal chemical raw materials for the process industries. Other commodities will be treated similarly in the market pages of the February, March, and April issues.

In May another special theme number will carry a data sheet of specifications and flow diagrams for chemical engineering processes, while in the Fall, the same type of presentation will be used to bring up-to-date the mounting list of materials for the construction of chemical engineering equipment. Thus at least three sections in the chemical engineer's data file will be given a substantial start in 1934.

During the past year we have been giving attention, perhaps with some justification, to chemical engineering achievements on the part of companies as well as individuals. We have been accused, again with some justification, of doing a little "back-patting," especially in the cases of those who have done an outstanding job in licking Old Man Depression. In 1934 we hope to have something to say on the other side of the score—something about shortcomings, about the new knowledge and experience needed if we are to continue to make progress. A well-known chemical engineer recently told us that in twenty years' experience he had never designed and built a special piece of process equipment without having to use empirical values or experienced guesses for some of the very simplest relationships. "What's Needed in Chemical Engineering" might well be the editorial theme for the May number and should logically be approached by way of the unit operations. It should stimulate research and lead to a better future basis for chemical engineering design and construction.

We hope we may be forgiven for usurping this space to talk about ourselves. But January is proverbially the month of plans and good resolutions. The latter, we know, are sometimes broken even before January is over, but just now we are in the mood to sign the pledge to "do our part," if we can, in making chemical engineering the profession it should be in order to meet the opportunities as well as the challenges of 1934.

Sidney D. Kirkpatrick

Volume 41—**Chemical & Metallurgical Engineering**—Number 1

Chemical & Metallurgical Engineering is the successor to *Metallurgical & Chemical Engineering*, which in turn was a consolidation of *Electrochemical & Metallurgical Industry* and *Iron & Steel Magazine*, effected in July, 1906.

The magazine was originally founded as *Electrochemical Industry*, in September, 1902, and was published monthly under the editorial direction of Dr. E. F. Roeber. It continued under that title until January, 1905, when it was changed to *Electrochemical & Metallurgical Industry*. In July, 1906, the consolidation was made with *Iron & Steel Magazine*, which had been founded eight years previously by Dr. Albert Sauveur. In January, 1910, the title was changed to *Metallurgical & Chemical Engineering*, and semi-monthly publication was begun Sept. 1, 1915. On July 1, 1918, the present title was assumed and weekly publication was begun Oct. 1, 1919. Monthly publication was resumed in March, 1925.

Dr. E. F. Roeber was editor of the paper from the time it was founded until his death on Oct. 17, 1917. After a brief interim he was succeeded by H. C. Parmelee. Ten years later, Nov. 1, 1928, Mr. Parmelee was elected vice-president of the McGraw-Hill Publishing Company and was succeeded in the editorship of *Chemical & Metallurgical Engineering* by Sidney D. Kirkpatrick.

The editorial staff of the magazine comprises: S. D. Kirkpatrick, editor; James A. Lee, managing editor; H. M. Batters, market editor; T. R. Olive, associate editor and R. S. McBride and Paul D. V. Manning, special editorial representatives in Washington, D. C., and on the Pacific Coast, respectively.
[Published each year as a matter of record.]

OUR ALPHABETICAL GOVERNMENT

What Does It Mean for PROCESS INDUSTRIES?

By R. S. McBRIDE
Editorial Representative of Chem. & Met. in Washington, D. C.

Many have thought the alphabetical agencies of Washington to be an unordered confusion, without systematic movement. Appearances have been deceptive in this regard; a real plan, as described in this article, underlies the whole program. Management must study this plan for industry is more dependent today on problems outside its own field than ever before. This interpretation of the Government program presents the broadest possible resume. The effort has been more to interpret the underlying philosophy than merely to recite facts and figures of official nature. No one can prove this philosophy, but everyone must take account of it. It is common sense to be informed whether or not one enjoys or approves of the knowledge gained.

EDITOR

NATIONAL planning is the order of the day. America, even more than Russia, is establishing a social economy on a planned basis. Government is a factor of new implication in every division of human activity. Chemical engineers in the process industries must note this and program their affairs accordingly.

Alphabetical agencies by the dozen have been erected in Washington. These seemingly diverse agencies are a part of a completely ordered program based on clean-cut philosophy seeking a definite objective. The chaos which appears on the surface is not real. Every queer-shaped jigsaw piece fits when one discovers what the picture is. Some of the pieces have not yet been shaped and some parts of the building are in the barest of outline. But it is a single structure and the progress of Presidential construction has gone so far that he probably dares not stop.

The objectives commonly discussed are those of an emergency nature. The real objective is long-time planning. In this planning one finds the President a socialist. But an accurate definition of that term is necessary to real understanding. Speaking before the Federal Council of Churches, the President provided such a definition. A generous paraphrase of his remarks on that occasion gives us this—"It is the duty of Government not only to provide opportunity for the underprivileged; Government should also reach down and lift the underprivileged." And it is fair to add that this lifting is to be done by the present Administration whether the underprivileged ask for a boost or not, in some cases even when the uplift seems to be resented.

Less public attention, but most Governmental importance, attaches to certain programming agencies which have been created by Presidential order. As a "general staff" in the New Deal army is the National Emergency Council. This super-cabinet undertakes inter-agency coordination and reconciliation. It is to be responsible for the merger and operation of all principal field offices, including compliance and enforcement agencies. It is the super-propaganda board, intended to place inquirers in contact with the proper Government body and to answer many of the questions without need of referring them to Washington. Never before in peace time has the Government had such a far-flung promotion agent. An unmentioned, but none the less evident, objective is the persuasion of the public to continue support of the New Deal program.

In contrast with the board of strategy mentioned above, the National Planning Board under the leadership of Frederic A. Delano, is seeking to create on a national scale an organized concept of the basis for adequate social conditions in the service of all the public. Through funds which it controls, it is offering aid to states and cities in their planning programs. Thus local effort will be stimulated and, by purse-string control, will be coordinated. The ultimate result is quite likely to be a new design for living.

Other programming agencies deal with statistical problems, with the scientific and technologic policies of the Government, with transportation, and with a national planning scheme which will ultimately cover agriculture,

TROUBLE IN PARADISE?

Brain Truster: Now wouldn't that be just like that Old Toughie from Congress Hill?

industry, and the conditions of urban and rural living. In the Central Statistical Board there is no attempt to do statistical work; the effort is merely to eliminate duplication, to establish sound technical systems throughout the Government, and, Heaven be praised, to eliminate needless duplication of questionnaires.

Science Advisory Board has exercised a like function in connection with specific inquiries of the President and other Government executives. It is aiding in the reorganization and long-time planning of policy with respect to science in Government. Furthermore, it is seeking by Presidential request to prevent undue damage to the scientific work through the pressing of economy measures. A specific sample of its work can be found in the creation of a committee appointed to advise on railway research, under the Federal Coordinator of Transportation, Mr. Eastman. This committee of distinguished scientists is trying to see how more science may be used in the public interest by furthering the research work, not of the Government, but of the railways themselves.

The Federal Coordinator of Transportation is taking a like long-time view of the economic and social problems, not only of the railways, but more broadly of transportation by all agencies. Of course, the immediate task is to recommend to the President and Congress means for promoting immediate coordination of the railways themselves, a task which the more lethargic Interstate Commerce Commission has never undertaken, partly through lack of authority, but more through lack of time and disposition.

EMPLOYMENT, rather than direct relief or dole, has been the objective of the Administration. The N.R.A. program increasing the number of wage earners in each division of industrial activity, is therefore, the keystone of the arch designed to bridge the chasm from depression into the Promised Land of prosperity. Initially, that agency had as its major objective the creation of more jobs. Unfortunately at times it became involved in methods and lost sight of its real objective. Methods then became an end in themselves.

Industry was asked to accept rather onerous burdens in higher wages, shortened hours of employment, and special labor concessions. The compensating reward of improved trade practices enforcible under codes has not always been provided as expected. But that reward will ultimately be granted if each industrial group persists in its effort toward that end.

Industries have undoubtedly created many new jobs, perhaps millions of them, and costs have risen correspondingly. Chisellers now officially and generally recognized as working against the public interest, as well as against the interest of their own industry, are somewhat fewer in number, certainly less evident. But the big stabilizing advantage of their complete discipline remains still a pot of gold at the rainbow's end.

Self-policing of tremendous labor developments under N.R.A. could not be expected. A National Labor Board was soon found necessary. At first this was merely a committee headed by Senator R. F. Wagner working under N.R.A. After successfully functioning from August to December, it was given independent status and its four months' proceedings ratified by Presidential order.

Progress under N.R.A. was necessarily a matter of months. Hence the President created two quick-acting agencies. "Emergency Conservation Work" is the official name of the forest camp agency, headed by Robert Fechner, that popularly has been called Civilian Conservation Corps. C.C.C. provided immediate employment in the summer for over 300,000 young men functioning in a quasi-military fashion, with subsistence provided in camps managed by experienced military officers.

The President also created in the late Fall the Civil Works Administration, with P.W.A. money. This direct relief agency was promised as an employer of 4,000,000 persons to do made-work, taking all of the able-bodied personnel from relief rolls and giving them jobs at regular pay instead of dole. Little industrial significance attaches to this activity as it is admittedly temporary, a stopgap to aid until Public Works Administration projects may be well under way.

The P.W.A. plan, financed with $3.3 billion of public money, was set up by Congressional authorization under a separate title of the National Industrial Recovery Act. It is intended to give employment over a considerable period of time, two or three years in most cases, on jobs where Federal money is granted or loaned. Under Secretary of Interior Ickes, it has allotted about $2.1 billion to such construction projects, including highways, naval ships, dams, and other waterway structures, and a multitude of other public and quasi-public works. The balance went to non-construction projects or to work directed by Congress or the President. Its activity is of greatest importance to industry because it is creating employment with compensation that goes directly into general buying power over a period of 20 to 50 months ahead. Because this agency became a money-allotting, rather than an actual construction, agency it has contributed very significantly to the planning efforts of the President and his program advisers. Quite contrary to the old-fashioned pork barrel, this program has had relatively little politics as a governing motive.

AGRICULTURAL Adjustment Administration has proved one of the major stones of the Presidential structure. Aiming primarily at the improvement of agricultural conditions, it has sought production control through the disbursing of huge sums of Federal money to those who contract with the Government to reduce acreage, to plow under cotton, to slaughter hogs, or otherwise to aid in crop curtailment. Within the compass of this agency has been evident the most bitter controversy between the two schools of thought active in Washington. The paternalistic school has lately gained dominance. But those activities of A.A.A. which related to industry have been transferred back to N.R.A. by reallotment of food code responsibility to General Johnson. Under its newly named administrator, Chester C. Davis, the principal activity of A.A.A. is production control and direct farm relief.

The newest factor and one of tremendous importance to all divisions of society is the proposal just now developing that the Federal Government can accomplish permanent farm relief only by buying up surplus acreage and removing submarginal lands from production. Initially the discussion suggested that 50 million acres be bought at an estimated cost of $350 million but recent figures are more modest. This submarginal land amounts to approximately one-seventh of the cropped acreage.

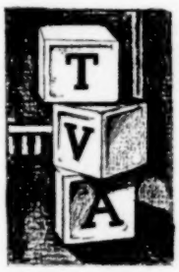
Proponents argue that the good farmers on the better land remaining could raise adequate agricultural supplies. In this conclusion they are all too modest. It is probable that the more competent farmers with not much over half the cropped acreage of the country could produce in years not afflicted by great droughts or disaster, agricultural crops about equal to the peaks of recent time. As chemical engineers have long recognized, it therefore still remains necessary to contemplate new industrial non-food uses for agricultural products if a real basis for permanent agricultural betterment is to be placed. The A.A.A. organization seemingly has not yet found time to make an effort in that direction. The planning has been rather for more immediate relief than permanent solution.

Alcohol control becoming of urgent importance with Repeal early in December occasioned the establishment of Federal Alcohol Control Administration. F.A.C.A. was provided with its necessary authority from A.A.A. sources. Codes and marketing agreements under the then current power of Secretary of Agriculture Wallace permitted the establishment of temporary measures which will prevail in this field, until Congress acts,

establishing a national policy of alcoholic beverage regulation.

The greatest importance to chemical engineering industry in this development lies in the fact that whenever the Federal Government seeks to accomplish regulation of an industrial group, it can, through one or another of the present emergency agencies, reach almost any objective of this sort which it seeks. There is no reason why almost any other commodity could not be handled in like fashion were there even a partial basis for proof of the urgency of public concern.

Furthermore, by indirect control through such agencies, the President and his advisers are gaining the most subtle of regulatory power. The limitation of beverage alcohol to that made from domestic agricultural materials is an example of the way in which new synthetic industry and important commodities can be controlled without new legislative authority. There is no evident reason why like results could not be accomplished with reference to other commodities, if the officials so desired.



Power Supply under favorable conditions at low cost is of greater importance to no group than to the chemical and process industries. Peculiar importance, therefore, has attached to the several new agencies created and new activities undertaken. Tennessee Valley Authority, set up for a great social experiment covering the entire watershed of the Tennessee River, is the outstanding corporate effort thus far undertaken. *Chem. & Met.* news pages have so often described that agency as to make further detailed description here unnecessary. It is worth while, however, again to emphasize that it probably typifies more fully than any other agency of the Government the real socialization objective of President Roosevelt himself. In the Valley it is the plan to raise the standard of living, to electrify the homes, to create neighborhood industry, and to do many other things which the Government in its wisdom feels should be done. It is a social experiment of the Government, by the Government, and for the Government. And the people of the Valley have little to say to the policies pursued.

So great an experiment with the prospective disbursement of such large sums of money naturally inspires envy elsewhere. Already there are vigorous proponents of a Missouri Valley Authority, of a Columbia River Valley Authority, and of others. That these are now mere local selfish imaginings is clear. Politics was absent in the President's original Tennessee effort. The objective there was purely social. But like absence of politics and logrolling from these other developments, is necessary; otherwise the outcome is unthinkable.

P.W.A. money has provided for numerous power developments, even more important than those being managed by T.V.A. It now appears that an aggregate of 8 million to 10 million continuous horsepower is to be developed by Federal money or aid. No one seems to know what can be done with this new huge reservoir of energy. Apparently some Federal officials seem to think that if there be enough power surplus, there will automatically come about further benefits of power utilization in the public interest.

The greatest single problem confronting the process industries today as a result of Federal activities unquestionably lies in this area of enlarged power utilization. Great new industries must enter these fields. Only industries can provide the long-hour, all-season, high-capacity load factor that is essential to economic success. No amount of Government subsidy can cover up the fact that these projects will be dollar and cent failures unless the power is used. Industry itself will probably have to provide the intelligence and the programming here.

Two Government efforts are being made to stimulate power utilization. One of these activities is being carried out by the Federal Power Commission with an allotment of $400,000 of P.W.A. money. The project of F.P.C. is a study of the cost of generation, transmission, and distribution of power with a view to establishing a national program. Most close observers believe that from that study will come a Roosevelt theory of public ownership of public utilities. The conclusion seems inescapable that the President is a thor-

NEW GOVERNMENT AGENCIES

FOR GENERAL PLANNING

National Emergency Council
Central Statistical Board
Science Advisory Board
National Planning Board
Federal Coordinator of Transportation

FOR EMPLOYMENT AND RELIEF

National Recovery Administration
National Labor Board
Civilian Conservation Corps, officially named "Emergency Conservation Work"
Public Works Administration
  Federal Subsistence Homestead Corp.
  Public Works Emergency Housing Corp.
Civil Works Administration
Federal Emergency Relief Administration
Federal Surplus Relief Corp.

FOR AGRICULTURE AND COMMODITIES

Agricultural Adjustment Administration
Tennessee Valley Authority
Electric Home and Farm Authority
Federal Alcohol Control Administration

FOR FINANCE AND CREDIT

Reconstruction Finance Corp.
Federal Home Loan Bank Board
  Home Owners Loan Corp.
Federal Deposit Insurance Corp.
Farm Credit Administration
  Commodity Credit Corp.

[And more are expected daily.]

ough believer in the fact that the public must control more fully, probably must own and operate, the major power stations and power systems. Industry may raise its hands with horror at this thought. But it should not be forgotten that Government has gradually taken over one function after another in the past, public defense, local policing, establishment and maintenance of highways, handling of the mails, education, and others. It may be that America is about to add this one more general activity to those which are now accepted functions of Government. Long-distance, interstate handling of energy, both electricity and gas, may result. The very recent proposals of a master Communications Commission show that in other public utility fields, like embryonic ideas are maturing.

With an entirely different objective, namely, increased household and farm use of electric power, the President has established as a close affiliate of T.V.A. the Electric Home and Farm Authority, Inc. That body with limited capital stock will have substantial loaning power. Its avowed objective is the provision of standard-quality electrical appliances at a low price with aid for the financing of these purchases by home and farm owners.

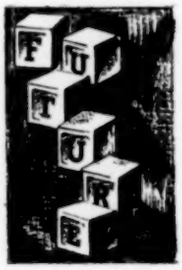
In connection with these power projects, one must recall that very low-cost, low-price power is contemplated. Industrial power prices in the Tennessee Valley begin at 7 mills and go down to 2.5 mills per kw.-hr. The average cost calculated for one other Federal project, the Bonneville Dam on the Columbia River, is talked of in terms of 1.4 mills per kw.-hr. Obviously the householder and farm user will not get power at these low average figures, but industry must look forward to utilization either by itself or its competitors at rates of this sort.

While referring to Government competition with industry, it is important to recall the definite Federal plans for the commercial manufacture of fertilizer through T.V.A. Apparently the President believes that a thorough test of fertilizer making under Federally controlled conditions, is necessary and socially desirable. There is a clear recognition that this effort may create painful competition for existing industry, but the leaders of the movement disavow any intention of doing such commercial damage.

It appears that only in the case of fertilizer has there been thus far any entry of the Government into actual manufacturing or merchandising projects hitherto exclusively private in nature. That this entry is so limited does not, however, remove the nose of the camel from the tent. Close attention to the trend is essential on the part of all, even those not directly interested.

Credit control seems to be a major objective of the Administration. This is explained in many ways, some believable, others of doubtful correctness. There can be no doubt, however, of the fact that the Government is now a major factor in the banking business of the United States. Reconstruction Finance Corporation, a Hoover-created hangover, developing from emergency bank relief into credit control with tremendous power, has entered the banking business. Some even allege (probably wrongly) that there is a desire on the part of Federal leaders to have R.F.C., through preferred-stock ownership in banks, become a dictator of banking practice. At the moment its major activities relate to railroads, banks, building and loan associations, insurance companies, and the like. Industry has not yet been a patron of this pawnbroker.

Of greatest concern in all these matters is the fact that he who holds the purse strings has power to decide others' course of action. Were the ultra-socialist wing of the present Federal group to gain ascendancy, a result not now thought likely, they might through these credit and finance tools implement their extreme views in such a fashion as to make them cut across all types of activity, including even industrial corporation management and planning.



WHERE DOES this all lead? This is a question that no one can answer. But there are several of our destinations now high enough above the horizon to permit identification.

1. America has gone too far wholly to turn back. It is almost unthinkable that even the most reactionary critic of present trends would ask that we abandon all of these efforts. Chaos and depression of unprecedented magnitude would surely follow the complete collapse of public confidence in the Government.

2. It seems likely that very cheap power will come as a permanent part of the American industrial structure. Whether this is publicly owned and operated or whether privately controlled by great super-corporations is immaterial to the user industry. Corporation planning must take account of the availability not only to itself, but also to competitive industry, of these cheap energy supplies.

3. The Government will be more of a factor in business than ever before. And as such it will tend to have social influence quite as much as economic. The social consequence of each industrial action must be weighed in the future just as much as the economic consequence. Where an unsocial decision is reached, one must expect the Government to be willing, and probably able, to intervene.

4. Government competition with industry is not immediately a prospect, except with respect to power, and perhaps temporarily, with respect to fertilizer. Other divisions of industry which avail themselves fully of the opportunities under N.R.A. for self-regulation, may count on a permanence of self-regulation undisturbed by Governmental intervention, except perhaps a closer scrutiny of prices to ultimate consumers, and certainly of wages and employment conditions.

5. Many of the present trends are favorable to big industry as contrasted with little, helpful to new constructive synthetic industry in contrast with old "natural" industries. However, the big, the powerful, the progressive must move forward with the greatest of care lest they appear to be working contrary to the public interest and thus bring on themselves new regulatory measures.

6. Above all, a new, unconventional ultra-social outlook is becoming more necessary in industry management than would have seemed humanly possible even six months ago.

NATURAL vs. SYNTHETIC

Almost as old as the chemical industry itself, this problem comes into new prominence as a result of the competitive situation in codified industries. Inter-product, inter-process competition is being sharpened not by chiseling but by the government's own effort to alter existing conditions. To change one factor such as labor may often disturb the delicate balance of other values that determine competitive relations. Some of the big battles of the chemical industry in 1934 are again going to be fought in Washington. In many of them, one of the principles involved is whether or not we are going to penalize technical progress in order to satisfy the short-sighted demands of certain groups that are battling for class advantage.

EDITOR

IN THE BATTLES of the Chemical Codes there have been some interesting skirmishes between industries and between separate groups within a single industry. These have not always had the attention they deserved. At a casual glance they may have appeared of no more significance than the usual jockeying for position that takes place in any competitive race. Yet in many cases they have involved a basic principle which sooner or later chemical industry must face.

The question came up prominently in the distillers' code where, presumably in the interests of the farmer, the source of beverage alcohol was specifically limited to American agricultural raw materials. It was opposed by some of the molasses distillers and those that produced alcohol synthetically—not because these firms necessarily desired to enter the liquor business, but rather because they opposed in principle a discrimination against a raw material or a process that had demonstrated economic and technical justification for its existence.

Again, in the case of the wood chemicals, the issue has been sharply drawn between the natural and synthetic products on the rather dangerous assumption that the former involves a greater proportion of labor and is therefore entitled to preferential treatment. This argument falls of its own weight when account is taken of the fact that charcoal is, or should be, the primary product of the hardwood distillation industry and that the wood chemicals in competition with synthetics require only a minor fraction of the total labor.

Synthetic nitrogen, fertilizer compounds, camphor and other synthetic organic chemicals are to a certain extent involved or likely to be involved in similar controversies. Already proposals have been made in at least one field to set up special "equalization" taxes in order to permit the older industry to compete with the newer developments. The proponents argue that their plight is not really different from that of the farmer and that they should receive comparable treatment. Others argue that special exemption should be made in certain chemical codes in order to permit the payment of lower wages in the older industries. Still another solution is to hold prices at levels which will permit all in the industry "to live and let live."

Some of the older industries do have economic and social justifications for their existence—to take care of peak loads, to conserve natural resources through waste utilization, or to provide industrial independence in the case of an emergency. But any industry which comes into the court of public opinion with a request for protection must come with clean hands. It must show that it has made a diligent effort to promote its own cause by doing research, not only on its producing methods but also to stimulate new uses for its products.

The actual experience of the United States over the past 50 to 75 years proves that scientific research and engineering development has created more jobs than it has destroyed. It is neither sound nor logical, therefore, to argue that the new must be penalized by artificial measures, such as specialized taxes in order to create employment. Such limitation would in fact destroy opportunities for new employment in far greater measure than it would encourage retention of labor in old jobs.

FAVORABLE OUTLOOK

FOR FOREIGN TRADE IN CHEMICALS

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Although faced with greater difficulties than ever before, in establishing and maintaining international exchange of goods, chemical industry has recently made such important gains in foreign trade that hopes for brighter future seem fully justified. Among the problems ahead none looms greater than the skillful handling of the tariff with its related quotas, import regulations, rationed exchange, and similar restrictions. With the strong position held by the United States a New Deal may also be forthcoming in this international game. To gain the full advantage of the opportunities offered alertness and vigilance on the part of our industrial leaders will be the watchword of the day.

EDITOR

CONTINUED EVIDENCE of general world economic recovery and foreign trade improvement is apparent. With increasing confidence and faith all major chemical producing and exporting countries surmounted the many handicaps to international business in 1933, showing increased export trade during the first nine months of the year. Stocks generally throughout the world have been depleted, and with betterment in the textile, soap and other chemical consuming industries, larger demand for industrial chemicals resulted.

Artificial barriers which became very popular in 1933, particularly in Europe, such as quotas, licensing systems, exchange restrictions, and the like, had comparatively little effect on total chemical exports; wherein the export trade of one country in one commodity might be affected adversely, another commodity was favored.

Japan, which country has been profiting from its embargo on the export of gold since 1931, its increase in plant capacities, and the devaluation of the yen, was able to make the largest increase in value of exports of chemicals, while the effect of the Imperial Conference on the Canadian imports from the United States was particularly noticeable. As for the U. S. chemical exports, a few commodities have made particularly good progress, showing new high marks. The progress was outstanding the latter part of the year, especially October and November, when exports and imports approximated the figures for the first three months of 1933.

The depreciation of the dollar has progressively stimulated the sale of certain American chemical products in Germany, according to Consul S. B. Redecker, at Frankfort. The gains were especially marked after July, and it should be emphasized that the increases occurred chiefly in those American chemicals of which Germany does not produce any or sufficient quantities to meet domestic requirements, while little effect has been observed in products of which Germany itself is a large producer. This is not only due to the high import duties, but more particularly to the Government's severe foreign exchange control. For chemicals of which the United States has been the principal supplier to Germany, such as carbon black, marked increases have been noted since July. On the other hand, the wide fluctuations in the dollar have in some instances offset the attractiveness of American quotations, due to the marked uncertainties and risks involved to importers.

Germany maintained its position in the first nine months of 1933 as the largest chemical exporter, with $134,600,000, an advance of 7 per cent in value, but a decline of 13 per cent in volume over the corresponding period of 1932. Imports to Germany during this period advanced 26 per cent in volume and 10 per cent in dollars, to $45,900,000, though figured in marks they dropped 4 per cent. Chemical exports from Germany to the United States fell 10 per cent in quantities shipped.

The United Kingdom continued to hold its position as third largest chemical exporter. No figures are available at this time to show the effect of the Imperial Conference on exports to the other countries of the Empire, but a trend is evident from the statistics of a few of

these. Although chemical exports amounting to $54,600,000 for the first nine months of 1933 exceeded in dollars the corresponding figure for 1932, the change in pounds sterling was small. Continued gains in exports in October and November, 1933, will likewise place the United Kingdom in a much more favorable position at the close of the year than at the end of 1932. Imports for the first nine months of 1933 failed to pick up; the value of $41,700,000 was two per cent below the corresponding figure for 1932.

The trend to procure larger share in the colonial trade was especially outstanding in the French trade in 1933. Chemical imports from the colonies were up 14 per cent in tonnage, 772,200 tons, valued at $5,300,000, while those from foreign countries remained about the same, 1,200,000 tons, valued at $46,400,000. Chemical exports to foreign countries totaled 1,100,000 tons, and $45,800,000; to the colonies 107,000 tons, and $10,400,000.

Belgium retrieved some of the trade lost in 1932; imports for the first nine months of 1933, 978,000 tons, $26,500,000, surpassed those for the entire 1932. Nine months exports of $34,400,000 (1,866,000 tons), one-fifth greater than the corresponding 1932 figure, approximated 1931.

Switzerland followed with improved export trade, but a decline in imports. Chemical exports for the first nine months of 1933, compared with the same period of 1932, improved 25 per cent in tonnage and 21 per cent in dollar value 60,800 tons and $20,800,000. The rather large advance in tonnage was due to the shipments of heavy commodities. Industrial chemicals accounted for one half of the total imports, valued at $14,500,000.

The most significant advances in the Japanese chemical exports in their effect on American competition, and contributing to the 65 per cent gain (based on yen) in total export value of $11,600,000 took place in coal-tar

EXPORTS OF CHEMICALS BY PRINCIPAL PRODUCTS

Source: Bureau of Foreign and Domestic Commerce

Article	Quantity in thousands (pounds except as otherwise specified)						Value (thousands of dollars)					
	1921-1925	1929	1930	1931	1932	1933*	1921-1925	1929	1930	1931	1932	1933*
Grand total, value	.....	.....	.....	.....	.....	.....	147,200	212,275	172,585	139,960	95,261	96,702
Chemical and allied products (Group 8)	.....	.....	.....	.....	.....	.....	107,564	152,109	127,855	100,094	70,408	68,031
Coal-tar chemicals—												
Benzol (gals.)	9,730	33,346	44,600	21,861	3,241	7,767	2,501	8,537	9,566	3,795	612	1,474
Coal-tar pitch (tons)	.....	10	27	51	188	174	.....	204	290	493	2,125	2,078
Colors, dyes, stains	[1]16,948	34,130	28,267	20,313	16,097	16,684	5,392	7,279	6,246	4,739	4,071	4,112
Other products, except medicinals	.....	.....	.....	.....	.....	.....	1,776	1,855	1,455	1,281	1,944	3,436
Medicinal and pharmaceutical preparations	.....	.....	.....	.....	.....	.....	16,293	21,467	17,801	15,104	10,027	8,828
Industrial chemical specialties—												
Insecticides, disinfectants, etc	.....	28,194	30,352	22,247	14,515	12,476	.....	5,344	5,761	3,886	1,874	1,867
Baking powder	3,890	5,315	4,517	4,177	2,570	2,543	1,568	1,730	1,434	1,269	616	535
Dextrine	[1]19,329	20,828	17,115	12,671	9,750	13,519	[1]773	983	780	536	358	447
Other	.....	.....	.....	.....	.....	.....	3,235	7,382	7,614	8,063	7,102	6,738
Industrial chemicals—												
Acids and anhydrides	.....	27,417	20,401	16,233	19,742	15,736	1,188	1,264	1,085	711	626	627
Alcohols—.												
Methanol (gal.)	788	498	952	583	770	973	732	403	483	241	324	415
Other	.....	3,500	3,965	3,052	3,174	4,140	1,046	488	544	330	297	363
Formaldehyde	[1]2,744	2,588	3,769	2,905	2,103	2,042	320	225	246	163	101	105
Other synthetic organic products	.....	8,595	4,970	9,382	21,367	20,914	.....	864	588	980	2,002	1,875
Nitro or aceto cellulose solutions, etc	.....	2,111	1,828	2,200	2,018	2,151	.....	625	520	536	373	396
Aluminum sulphate	[1]33,900	53,176	50,509	55,335	43,099	50,993	[1]452	608	573	568	463	491
Calcium compounds—												
Calcium chloride	.....	30,851	42,699	48,703	35,494	30,577	.....	363	514	567	378	304
Other	59,547	13,614	11,927	11,224	5,861	.....	1,604	518	829	852	224	.....
Sodium compounds, n. e. s.—												
Borate (borax)	25,979	159,768	165,863	173,876	179,282	153,668	1,176	2,935	3,058	3,359	2,678	2,172
Hydroxide[2]	100,872	121,077	126,379	131,189	110,977	110,594	3,400	3,516	3,706	3,465	2,360	2,372
Other	.....	424,350	226,002	197,604	120,323	132,378	4,149	5,938	3,863	3,136	2,184	2,323
Gases, compressed and liquefied	.....	12,735	12,173	13,133	12,560	27,174	.....	1,058	994	826	644	759
Other industrial chemicals	.....	.....	.....	.....	.....	.....	10,569	8,361	6,013	4,042	2,306	2,474
Pigments, paints, varnishes—												
Mineral earth pigments, etc	[1]28,944	41,960	45,132	33,056	15,438	19,991	[1]925	863	535	429	286	323
Carbon black, bone black, and lampblack	[1]33,637	95,030	87,934	99,487	101,255	128,962	3,175	8,455	5,977	5,209	4,509	4,714
Other chemical pigments	.....	69,339	56,248	39,980	20,851	13,904	2,788	5,277	4,204	2,745	1,441	1,170
Nitrocellulose lacquers (gal.)	([3])	262	327	733	510	614	([3])	881	1,012	1,518	983	1,054
Other paints, stains, enamels	.....	.....	.....	.....	.....	.....	6,476	9,936	7,303	4,650	2,773	2,597
Varnishes (gal.)	[3]890	1,169	774	377	293	317	[3]1,587	2,181	1,442	547	359	348
Paint specialties (gal.)	.....	.....	.....	19	13	.....	.....	1,519	1,217	28	15	.....
Fertilizers and materials—												
Sulphate of ammonia (tons)	129	145	82	67	15	12	7,924	6,296	2,910	2,220	408	301
Phosphate rock (tons)	734	1,143	1,226	951	613	775	5,950	5,387	5,631	4,277	2,796	3,299
Superphosphates (tons)	37	85	112	82	24	31	516	1,489	1,595	941	259	292
Other (tons)	68	162	133	144	195	128	3,082	7,269	5,149	5,573	5,190	3,475
Explosives and fuses—												
Dynamite	14,560	16,277	9,090	5,546	4,607	5,520	2,270	2,228	1,280	754	600	717
All other	.....	.....	.....	.....	.....	.....	1,622	2,321	1,671	980	681	694
Soap and toilet preparations—												
Soap, washing powders, etc	.....	74,540	62,806	47,252	34,917	23,497	8,853	7,277	5,993	4,301	2,847	1,885
Dentifrices	[1]3,374	3,777	3,179	2,561	1,844	1,373	[1]2,712	2,901	2,522	2,244	1,308	989
Talcum, other toilet powders	.....	.....	.....	.....	.....	.....	[1]1,660	1,531	1,484	1,245	647	555
Creams, rouges, etc	.....	.....	.....	.....	.....	.....	[1]1,144	2,048	2,074	1,890	792	695
Other toilet preparations	.....	.....	.....	.....	.....	.....	2,240	2,302	1,897	1,603	828	731
Related products from other groups	.....	.....	.....	.....	.....	.....	39,636	60,166	44,730	30,866	24,853	28,671
Naval stores, gums, and resins—												
Rosin (bbls.)[4]	1,038	1,437	1,264	1,061	1,098	1,113	11,278	20,442	14,266	8,059	6,255	7,146
Spirits of turpentine (gal.)	10,636	16,304	15,142	12,214	10,940	12,169	9,988	8,530	6,612	4,813	4,410	5,259
Other gums, etc	.....	.....	.....	.....	.....	.....	1,113	2,025	1,820	1,433	922	931
Crude drugs and botanicals	.....	4,683	4,907	4,102	3,852	4,218	3,174	3,690	2,576	2,413	1,193	1,050
Essential oils	.....	6,043	3,852	4,534	4,722	2,098	1,208	2,436	1,993	1,472	1,311	1,564
Linseed oil	2,820	2,208	1,592	1,094	842	787	364	288	214	111	60	72
Sulphur (tons)	473	873	609	420	359	488	7,600	18,278	12,972	9,269	7,424	9,502
Pyroxylin products—												
Sheets, rods, tubes, scrap, film support	2,909	3,945	5,330	3,858	4,471	4,380	2,998	2,190	2,399	2,155	2,607	2,608
Manufactures		1,022	635	221	127	91		1,136	839	403	199	136
Matches	[1]1,062	1,131	1,566	825	264	125	215	138	154	103	51	21
All others[5]	.....	7,415	5,960	5,052	4,184	2,314	1,698	1,013	886	636	421	382

*11 mos. ending November, 1933. [1]Average for years 1922-1925. [2]Includes lye prior to 1929. [3]Lacquers included with varnishes. [4]Barrel of 500 lb. [5]Includes bones, gelatin, glue, natural dyes, and wax.

IMPORTS OF PRINCIPAL CHEMICAL PRODUCTS

Source: Bureau of Foreign and Domestic Commerce

Article	Quantity in thousands (pounds except as otherwise specified)						Value (thousands of dollars)					
	1921-1925	1929	1930	1931	1932	1933*	1921-1925	1929	1930	1931	1932	1933*
Grand total, value	.....	.....	.....	.....	.....	.....	179,590	232,977	172,785	117,814	72,068	77,887
Chemicals and allied products (Group 8)	.....	.....	.....	.....	.....	.....	112,100	144,062	112,070	82,738	47,852	54,500
Coal-tar chemicals—												
Dead or creosote oil (gal.)	62,713	79,301	66,922	36,885	29,300	17,949	8,701	10,119	7,806	3,598	2,647	1,092
Other crudes	.....	.....	.....	.....	.....	.....	889	2,051	1,376	793	577	810
Intermediates	2,554	3,962	2,247	1,692	1,769	1,670	658	1,646	1,075	679	786	1,394
Colors, dyes, stains	3,895	7,593	4,952	4,944	4,245	4,705	5,147	8,448	5,284	5,512	4,688	5,658
Other finished products	.....	279	221	140	124	84	663	559	731	582	460	260
Medicinal and pharmaceutical preparations	.....	.....	.....	.....	.....	.....	4,917	6,422	4,948	3,973	2,530	3,229
Industrial chemicals—												
Acetic acid	.....	29,235	22,377	15,292	13,976	30,665	.....	2,117	1,498	803	843	1,936
Arsenious (white arsenic)	[1]18,880	26,314	21,559	15,581	13,765	19,060	[1]1,551	956	744	451	358	459
Tartaric acid	[1]3,074	2,220	2,912	2,246	1,818	485	[1]654	689	779	477	298	82
Other acids and anhydrides	.....	20,741	4,332	4,305	3,092	4,543	1,385	658	397	290	215	383
Ammonium compounds, n. e. s.	16,254	20,030	15,454	12,904	11,060	13,981	865	697	511	384	269	330
Cobalt oxide	[1]258	476	426	322	226	522	[1]500	885	769	391	220	384
Glycerin	11,765	20,345	14,362	12,108	7,718	8,643	1,306	1,365	924	667	346	383
Iodine	304	627	494	279	632	1,326	847	2,249	1,798	998	2,226	2,818
Potassium compounds, n. e. s.—												
Bitartrate, crude, argols, etc	20,054	18,001	18,083	19,314	18,108	11,435	1,436	2,113	1,836	1,605	996	603
Carbonate	8,530	22,644	18,241	15,167	10,457	12,435	368	1,024	848	664	429	595
Nitrate, crude (tons)	4	13	13	16	17	25	274	546	620	708	831	861
Other compounds	31,362	49,315	28,523	28,299	19,167	21,233	1,952	2,407	1,328	1,282	865	1,066
Sodium cyanide	22,802	40,047	26,401	18,695	17,585	20,141	1,982	3,199	2,043	1,711	1,729	1,849
Other sodium compounds, n. e. s.	.....	.....	.....	.....	.....	.....	1,439	3,167	2,268	1,582	1,274	1,432
Other industrial chemicals	.....	.....	.....	.....	.....	.....	9,710	8,627	6,953	5,201	3,551	3,440
Pigments, paints, and varnishes	.....	.....	.....	.....	.....	.....	3,080	3,822	2,613	2,013	1,445	1,858
Fertilizers and materials—												
Ammonium sulphate (tons)	9	19	34	114	307	328	479	763	1,160	3,196	5,410	5,743
Calcium cyanamide (tons)	60	184	145	51	63	53	3,049	6,221	4,874	1,537	1,628	1,216
Sodium nitrate (tons)	780	930	569	551	50	99	37,158	34,913	21,445	21,112	1,472	1,920
Other nitrogenous (tons)	85	193	215	111	72	143	2,856	8,509	8,194	4,065	1,851	3,015
Phosphates (tons)	41	105	96	71	67	59	1,084	2,149	1,909	1,371	942	877
Potash fertilizers—												
Chloride, crude (tons)	132	231	273	181	78	92	4,722	8,225	9,930	6,518	2,795	3,286
Manure salts (tons)	223	391	362	179	101	103	2,315	5,113	5,048	2,583	1,255	1,215
Sulphate, crude (tons)	55	80	86	57	28	54	2,257	3,648	3,947	2,628	1,202	2,090
Other (tons)	165	77	113	56	50	80	1,346	653	984	508	460	758
Other fertilizers (tons)	59	100	73	60	53	65	1,598	2,146	1,660	1,214	844	1,202
Explosives	.....	.....	.....	.....	.....	.....	918	960	911	567	371	235
Soap and toilet preparations—												
Soap	4,731	7,030	7,022	5,682	4,762	3,548	772	1,263	1,082	815	578	411
Perfume materials	.....	.....	.....	.....	.....	.....	} 6,304	{ 3,296	2,142	1,101	873	911
Perfumery and toilet waters	.....	.....	.....	.....	.....	.....		{ 1,504	986	719	342	450
Other toilet preparations	.....	.....	.....	.....	.....	.....		925	575	430	245	192
All other articles	.....	.....	.....	.....	.....	.....	.....	11	70	9	2	60
Other related products	.....	.....	.....	.....	.....	.....	67,490	88,915	60,715	35,076	24,216	.....
Casein or lactarene	17,421	27,583	18,500	3,503	1,201	8,082	1,916	3,323	1,920	143	38	437
Naval stores, gums, and resins—												
Varnish gums and resins—												
Damar	[2]20,864	19,131	11,217	11,734	8,553	11,617	[2]2,846	2,403	1,017	704	344	511
Lac, crude, seed, etc	.....	7,976	8,689	7,191	9,518	10,960	.....	2,579	1,730	934	1,015	833
Shellac	27,183	33,335	18,982	11,962	11,321	8,715	14,958	12,789	5,190	1,953	1,511	849
Other	[1]33,884	42,846	23,663	16,944	11,083	15,648	[1]4,611	3,701	1,821	984	459	741
Tar, pitch, and turpentine	.....	.....	.....	.....	.....	.....	[1]200	335	213	57	103	156
Camphor—												
Natural, crude		4,204	1,058	2,004	1,799	1,808	1,341	1,580	419	714	513	369
Natural, refined	{ 2,248	{ 1,431	1,032	1,152	1,034	1,529	} 1,758	{ 793	557	546	358	451
Synthetic	{ 2,691	{ 3,957	2,405	1,798	1,460	721		{ 1,376	851	588	406	173
Chicle	8,913	13,223	13,957	8,928	4,948	3,453	4,455	6,621	7,022	4,195	2,023	947
Gum arabic	8,034	8,471	6,954	7,264	5,509	5,078	842	913	973	536	227	237
Other gums, resins, balsams	.....	.....	.....	.....	.....	.....	1,856	2,547	1,659	1,919	954	1,011
Crude drugs and botanicals—												
Pyrethrum flowers	[1]4,451	9,013	8,536	4,521	12,111	9,322	[1]1,413	2,061	1,333	522	1,309	1,316
Licorice root	63,499	88,267	57,372	59,283	57,569	31,517	2,167	2,260	1,351	1,424	1,156	661
Opium, crude	105	168	122	130	130	109	502	1,071	686	394	274	282
Other	20,460	33,307	28,811	26,784	21,671	22,922	3,012	5,190	4,309	3,585	2,265	1,984
Essential and distilled oils	.....	.....	.....	.....	.....	.....	5,278	7,576	5,643	3,654	2,746	2,995
Linseed oil	54,836	9,961	2,125	235	25	10,650	4,326	739	205	11	1	387
Tung oil	75,354	119,678	126,323	79,311	75,922	109,219	9,247	14,972	12,487	4,426	3,434	4,307
Pyroxylin, celluloid, pyralin, etc	.....	.....	.....	.....	.....	.....	1,217	2,713	1,500	957	591	.....
Matches	.....	.....	.....	.....	.....	.....	1,963	3,435	1,452	1,435	922	639
All others[3]	.....	.....	.....	.....	.....	.....	6,074	9,939	8,378	5,394	3,566	4,101

* 11 mos. ending November, 1933. [1] Average for years 1923-1925. [2] Includes kauri. [3] Includes bones, gelatin, glue, dyeing materials, and waxes.

dyes, carbide, sulphur, paints, and toilet articles. Chemical imports, up 17 per cent based on the yen, reached a value of $28,600,000. The results of the expansion of the Japanese chemical industry is especially notable in the examination of the import figures. Imports of coal-tar distillates advanced from 3,000,000 lb. during the first nine months of 1931 to 14,000,000 lb. in corresponding period of 1933; carbon black receipts nearly doubled; methanol more than doubled; less than half as much ammonium sulphate, crude, was imported; imports of crude sodium nitrate increased 19 per cent, imports of caustic soda and other sodas, particularly sodium bicarbonate, dropped markedly. Progress in the dyestuff industry is particularly outstanding, and Japan is now exporting large quantities of low-priced dyes.

Chemicals shared proportionately in the decline in all Canadian imports. The effect of the Imperial Conference is shown by the larger amounts, 11 per cent, received from the United Kingdom during the first nine months of 1933, than during the corresponding period of 1932, although total chemical imports declined 16 per cent, and receipts from the United States were 20 per cent less.

A big decline in all three instances took place in the first quarter of 1933, in which interim the United States suffered the most, a loss of 38 per cent. In the next six months, April-September, imports from the United States were off only 10 per cent. Of total imports amounting to $24,174,000 (Canadian, equivalent to U. S. $21,273,000) during January-September, 1932, 15 per cent was credited as coming from the United Kingdom

and 66 per cent from the United States. In the January-September 1933 period the quantities originating in the United Kingdom had increased to 19 per cent, while those from the United States had declined to 63 per cent, out of a total of $20,222,000 ($17,841,000).

Concurrent with the 16 per cent decline in imports, exports rose 17 per cent to $9,800,000 (U. S. $8,453,000) in the January-September, 1933 period. Shipments to the United States were 30 per cent greater, while those to the United Kingdom declined 13 per cent. Out of the total shipped, United States took 49 per cent, the United Kingdom only 19 per cent, compared with 43 and 25 per cent, respectively, in the similar 1932 period. An outstanding item was ammonium sulphate, exports of which advanced from 30,000 tons to 51,500 tons.

After a poor start in the first quarter of 1933, U. S. exports of chemicals and allied products showed a steady gain for the remainder of the year. During the first 11 months they reached a value of $96,700,000, compared with $95,300,000 for the entire 1932. Imports also gained in spite of the depreciated dollar, from $72,100,000 for the year of 1932, to $77,900,000 for the 11 months of 1933. This is due partly to increased industrial activity and partly to anticipation of higher prices.

Any material improvement in chemical exports is largely dependent upon the continuation of economic recovery in our export markets, particularly Europe and Latin America. Low dollar exchange should assist some, and improvement in silver prices should help, at least temporarily in the Far East. Recognition of Russia is not expected to affect materially United States exports of chemicals, judging from purchases during recent years. Russia appears chiefly interested in machinery, to build up domestic production. Additional handicaps to our exports that may be imposed by various countries in the form of quotas and licensing systems, will likely be offset to some degree by bargaining agreements now being negotiated.

Final figures showing countries of destinations for American chemical exports will not be available for several months, but it is believed that there were no radical changes in 1933. Undoubtedly Canada will maintain its position as largest purchaser, followed closely by the United Kingdom, with other major countries being Germany, France, Mexico, Argentina, Brazil, China, Japan, Philippine Islands, and Australia.

EXPORTS OF MAJOR CLASSES OF CHEMICALS, BY COUNTRIES OF DESTINATION

(Value in thousands of dollars; Source: Bureau of Foreign and Domestic Commerce)

Country	Coal-tar products			Medicinal and pharmaceutical preparations			Industrial chemical specialties			Industrial chemicals			Pigments, paints, and varnishes		
			Jan.-June,			Jan.-June,			Jan.-June,			Jan.-June,			Jan.-June
	1931	1932	1933	1931	1932	1933	1931	1932	1933	1931	1932	1933	1931	1932	1933
Total	10,308	8,752	5,989	15,103	10,027	4,874	13,754	9,949	4,944	19,774	14,958	7,185	15,127	10,366	4,834
Europe	4,943	3,911	2,791	4,868	2,355	996	4,920	2,683	1,483	5,654	4,033	2,073	6,827	4,778	2,315
France	364	2,339	1,613	45	30	20	528	257	115	354	372	226	1,136	1,013	500
Germany	1,429	171	419	73	59	26	760	434	348	1,427	1,182	469	890	759	333
Netherlands	1,459	338	58	80	64	24	137	171	79	349	326	180	269	218	148
Spain	124	270	233	299	260	121	138	107	52	63	61	30	182	135	84
United Kingdom	1,172	90	186	3,847	1,524	628	2,220	1,136	537	2,807	1,792	1,006	2,925	1,680	707
All other	395	703	282	524	418	177	1,137	578	352	654	300	162	1,425	973	543
North America	1,682	1,613	687	4,078	3,060	1,484	4,910	4,034	1,869	8,834	7,297	3,130	3,920	2,444	1,020
Canada	1,423	1,392	497	974	777	346	3,622	3,065	1,351	6,301	5,120	2,036	2,439	1,404	544
Mexico	158	120	122	683	557	277	377	275	144	1,090	969	489	427	267	143
Cuba	46	55	28	966	697	289	323	257	149	610	511	264	287	189	87
All other	55	46	40	1,455	1,029	572	588	437	225	833	697	341	767	584	246
South America	233	292	168	2,574	1,744	1,100	1,655	1,175	564	1,876	1,207	857	1,528	1,046	603
Argentina	100	103	46	661	401	288	796	583	246	540	431	237	617	422	206
Brazil	47	112	53	244	194	177	135	130	88	419	329	297	207	174	134
All other	86	77	69	1,669	1,149	635	724	462	230	917	447	323	704	450	263
Asia and Oceania	3,413	2,899	2,341	3,128	2,561	1,160	1,740	1,591	767	3,303	2,345	1,075	2,364	1,767	748
British India	466	305	63	1,032	974	394	249	244	78	118	179	74	177	104	65
China, Hong Kong, Kwantung	1,900	1,615	1,137	451	363	155	204	181	112	292	212	101	272	231	87
Japan	881	857	1,060	343	216	70	470	413	264	1,976	1,218	463	811	530	218
Philippine Islands	44	29	22	721	511	354	256	240	98	424	380	194	540	408	198
Australia	67	53	32	235	246	80	206	276	125	244	212	171	174	255	98
All other	55	40	27	346	251	107	355	237	90	249	144	72	390	239	82
Africa	37	37	3	456	307	133	528	467	261	107	76	49	488	330	148
Union of South Africa	8	8	3	310	207	91	291	296	115	92	54	31	417	263	121
All other	29	29	...	146	100	42	237	171	146	15	22	18	71	67	27

Country	Fertilizers and materials			Explosives, fuses, etc.			Soap and toilet preparations			Naval stores, gums, and resins			Sulphur		
			Jan.-June,			Jan.-June,			Jan.-June,			Jan.-June,			Jan.-June,
	1931	1932	1933	1931	1932	1933	1931	1932	1933	1931	1932	1933	1931	1932	1933
Total	13,011	8,653	3,090	1,733	1,281	698	11,282	6,422	2,488	14,304	11,587	6,044	9,269	7,445	3,454
Europe	5,372	5,453	1,631	17	15	...	3,707	921	391	8,681	7,580	3,791	5,142	2,913	2,096
France	1,161	2,421	255	1	1	...	119	83	44	9	5	4	1,733	1,313	988
Germany	817	401	237	...	...	...	80	52	19	2,188	1,929	1,047	1,999	730	425
Netherlands	821	472	359	(1)	1	...	167	119	37	1,363	1,382	607	488	316	241
Spain	1,355	785	221	...	...	...	63	45	26	5	5	5	139	98	...
United Kingdom	47	134	12	14	7	...	2,440	261	166	3,954	3,306	1,608	568	407	209
All other	1,171	1,240	547	2	7	...	838	361	99	1,162	953	520	215	49	233
North America	3,303	1,233	246	777	661	274	3,291	2,354	782	1,664	1,145	675	2,623	2,222	835
Canada	2,700	967	143	100	70	23	1,514	1,099	197	1,350	934	555	2,156	1,817	640
Mexico	170	82	38	454	379	164	97	63	31	34	23	21	148	164	44
Cuba	84	71	22	53	34	15	180	118	39	183	109	58	2	1	3
All other	349	113	43	170	178	72	1,500	1,074	515	97	79	41	317	240	148
South America	32	14	10	630	389	200	850	511	255	1,834	1,266	753	191	206	76
Argentina	1	...	...	2	2	33	205	119	27	746	467	255	147	127	34
Brazil	(1)	1	2	12	68	...	47	36	28	700	486	369	17	63	33
All other	31	13	8	616	319	167	598	356	200	388	313	129	27	16	9
Asia and Oceania	4,035	1,700	988	310	216	224	2,936	2,268	971	1,957	1,504	768	976	2,000	310
British India	14	8	3	...	...	...	651	588	221	7	10	8	1	...	...
China, Hong Kong, Kwantung	104	82	15	145	31	74	291	229	134	124	92	68	21	32	2
Japan	2,595	920	794	1	...	1	168	90	27	922	690	323	(1)	...	...
Philippine Islands	497	362	173	156	178	149	1,076	867	410	26	23	15	3	2	...
Australia	1	(1)	...	2	3	...	82	57	21	409	375	169	507	1,255	108
All other	824	328	3	6	4	...	668	437	158	469	314	185	444	711	200
Africa	269	251	214	...	...	...	498	368	89	168	92	57	337	104	137
Union of South Africa	1	(1)	...	...	...	...	383	295	60	122	69	44	107	6	...
All other	268	251	214	...	...	...	115	73	29	46	23	13	230	98	...

[1] Less than $500.

CHEMICAL INDUSTRY MUST FACE NEW LABOR PROBLEMS AND POLICIES

By EDWIN C. ECKEL

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The New Deal has brought about increased recognition of labor, and the formulation of new and equitable policies to protect the interests of those who toil has become one of the major problems in the new order. The author, who served with distinction as Labor Advisor for the Chemical Codes, believes that in this re-alignment the technical man may find himself to be "the forgotten man." He advocates a more vigorous and determined policy in this connection, and through new organizations, if the already existing professional societies do not quickly grasp the opportunity.

EDITOR

AMERICAN chemical industry, in common with all of our other large-scale industries, is facing very serious changes in its relation to labor of all kinds. Some of these changes will be accepted by almost everyone in the industry as being entirely beneficial; others, on the other hand, are objected to very seriously by many industrialists, on various grounds. What we must keep in mind is that these developments, to a large extent, are no longer matters of individual choice; they are involved in the various chemical codes which have been accepted or are still under consideration, and it should be possible to discuss them in large part as questions of fact and not as subjects for argument. In the present brief discussion of the subject I shall try to reach that detached and impersonal viewpoint.

Some of the principal changes which have affected all branches of the chemical industry may be briefly stated in advance of discussing two or three particular problems of special interest. First of all, we must note that all of the codes, for the first time in American industrial history, prescribe minimum wages and maximum hours for common or unskilled labor. Second, all of the codes require limitations on the employment of minors, and many of them contain requirements as to safety and health conditions; both of these, it is true, have frequently been the subject of State legislation, but this is the first time that they become objects of a broader Federal rule. Third, and less important in my opinion, though given first place in all public discussions of the matter, is the new relation of labor to capital involved in the tacit agreement that collective bargaining is accepted as the normal method of dealing between the two.

The provisions as to maximum hours of work reached a certain degree of uniformity in the various chemical codes, though much of this uniformity is apparent only, due to the various exceptions and the complicated forms in which these exceptions are stated. It would be difficult to discuss the various exceptional features in brief form, but we may say that so far as the basic maximum of working hours is concerned the normal for the chemical industries is now fixed at 40 hr. per week; that in the case of salt it was placed at 42 hr.; while in the pyrotechnics industry, because of its highly seasonal nature, a maximum of 48 hr. weekly was permitted during the manufacturing seasons.

With regard to minimum wages for common or unskilled labor, which it may be noted is the only class really considered by the code, quite large variations are found,. not only among different sections of the chemical industry, but in different parts of the country. It seems best, therefore, to tabulate the base rates of wages set in the different industries and for the different sections, as shown in Table I.

Table I. Minimum Base Wages in Principal Chemical Codes
(*In cents per hour.*)

Industry	North	South	Pacific Coast
Fertilizer	35	25	40
Paints	40	36	40
Hardwood distillation	30	25	30
General chemicals	40	35	40
Viscose	31¼	31¼	31¼
Pyrotechnics	40	40	40
Salt	35	30	35

The actual situation in regard to collective bargaining is or should be well understood. It arises from the universal inclusion, in all of the chemical and related codes, of a clause specifically repeating without any qualification whatever the following words:

> "Employees in the industry shall have the right to organize and bargain collectively through representatives of their own choosing and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other material aid or protection."
>
> "No employees or no one seeking employment in the industry shall be required as a condition of employment to join any company union, or to refrain from joining, organizing or assisting a labor organization of his own choosing."

The general purport of these two clauses is clear enough, as is well evidenced by the manners in which they were received by the representatives of capital and labor. They throw the balance definitely in favor of unionism as against the open shop, and in favor of self-controlled as against company unions. But with these general facts accepted there are still certain phases of the labor situation the future of which is not yet clear, and to some of these we may devote further attention.

The uncertainties regarding the future arise from such facts as the exclusion, tacitly or expressed, of certain large and important working classes from the protective clauses of the codes; the questions as to the indirect influences of labor—as distinct from union controls—such as through the development of Works Councils and the appointment of labor representatives on code authorities; and the highly important but rarely discussed question as to the ultimate form of the labor unions themselves, all these are still matters for future development, and all of them will repay study in all industries. The fact that so many critical points are still left open is due rather to the uncertain attitude of existing labor organizations on these points than to any real concerted opposition on the part of industrialists. There was, for example, no definite or organized attempt to protect the so-called "white-collar" worker in any way whatever; such protection as is incidentally given in most codes was due to the sense of fairness of individual industrialists and administrators rather than to the efforts of labor leaders.

A few codes express a pious wish for the appointment of labor representatives on the code authority; but none of the chemical codes, so far as I recall, has any suggestions as to the place of the works councils in any individual industry. I do not believe that any industrial leader would have seriously opposed such councils; the matter was simply passed over as of no particular interest to the existing labor organizations.

By force of circumstances the point most seriously pressed by labor groups was clear recognition of collective bargaining. And in all discussion of that point, on both sides, it was always tacitly assumed that the bargaining under discussion would be carried on by labor unions of the current type. That does not seem, to me at least, to be a necessary assumption as to future trends of development. We may indeed see labor organizations related much more closely to particular industries—vertical rather than horizontal unions. The economic advantages of such organization seem clear; the disadvantages are not immediately obvious to an outside observer, though they seem clear enough to existing labor leaders.

Whatever we may think about the economic advisability of ordinary labor organizations, it is clear that when we come to consider the possible organization of technical employees the possibilities of differences of opinion are even more greatly increased. So what is said here must be taken as in some sense merely the expression of a personal opinion: What may give it value is that it is the personal opinion of one who, judged from any standard, would unquestionably fall in the "technician" class. For by technician, in this discussion, we must include all our so-called "professional" men and their assistants. In the chemical industries we think of course chiefly of the chemists and chemical engineers; but we cannot properly limit the problem so closely. For at one stage or other of a chemical industry, particularly in the case of a fully integrated corporation, we may find not only chemical technicians, but physicists, civil engineers, mining engineers, geologists, architects. It was from this broader viewpoint that the first attempt at technician organization took place in 1933, and it is from that broader viewpoint that, to my mind, the whole matter must finally be considered.

What struck me forcibly during the progress of the various chemical and related mining codes was the peculiarly isolated and difficult position in which the codes were placing the large class of professional and semi-professional technical employees. Most of the members of this class were and are trained college graduates. Many, if not most of them, are members of their appropriate national professional societies. This select group, on whose labors the industries were practically based, were in effect thrown to the wolves. Every other class was carefully protected by its own or outside efforts. The owners and directors covered themselves with the "fair practice" section of the codes, the laborers, white and black, skilled and unskilled, were protected by minimum wage scales, maximum hour restrictions, and various other shields. The technicians alone had no share in the New Deal. They were in almost every case specifically exempted from the provisions as to overtime pay, and indeed as to minimum pay scales.

In the face of such conditions, what did our professional societies, with their high dues and well paid secretaries, do to protect their junior members and those still younger who might later become members? Being a member of several societies of the type I can say frankly that not one of them exerted the smallest possible effort, in this national emergency, to protect the technicians of the country. Society codes were introduced, it is true, and each one that arrived was scanned in the hope that it might be the one to contain a sound and helpful suggestion. But each one was, after all, merely a code of professional ethics. Engineers, architects, and chemists, as represented by their national societies, were assumed to have no interest whatever in matters of overwork or underpay. The professional codes were simply to insure that they would not too grossly underbid one another on contracts.

(*Concluded on page 23 of this issue.*)

NEW PROFESSIONAL RESPONSIBILITIES FOR CHEMICAL ENGINEERS

By H. C. PARMELEE
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For years the older branches of engineering have struggled, in an uncoordinated way, with the problems of professional development and recognition. Chemical engineering, perhaps because it is much younger as a profession, has done little toward formulating its own "design for living." But now comes the opportunity to join with the mechanical, civil, electrical and mining engineers in a broad program leading toward certain objectives of vital concern to the whole engineering profession. Dr. Parmelee, as one of chemical engineering's representatives on the new Engineers' Council for Professional Development, is a member of the executive committee as well as the committee on professional training. His statement of the Council's plans is one that should stimulate thought and action on the part of chemical engineers.

EDITOR

CHEMICAL ENGINEERING marches on, professionally as well as technically. A fair measure of the professional progress of the past ten years can be made by contrasting for a moment the matters that were agitating chemical engineers a decade or less ago, with the problems that concern them today. In the American Institute of Chemical Engineers we were then struggling with definitions and phraseology, with nomenclature and standards—all indicative of a young and budding profession seeking first to find and unify itself and then to gain acceptance and recognition from the outside world. Happily that adolescent period has passed, with its argument, debate and campaigns of education. Today chemical engineering is accepted as a distinctive branch of engineering, and its exponents are recognized as substantial members of the engineering profession.

But maturity has not yet been reached, and with growth and development have come new opportunities and responsibilities with which every chemical engineer should be familiar. They lead eventually to the goal of public recognition of engineers as a professional group. Their object and purpose is to enhance the status of engineers as members of society and not merely as technologists submerged in the problems of industrial production.

There has been a good deal of groping in this direction for some time past. Outside the technical societies, but nevertheless among their members, several groups and associations have been formed for the avowed purposes of promoting the material welfare of engineers, of making them vocal in public affairs, and of setting up standards of professional recognition through a system of examination and licensing. In this manner salients have been pushed out along the front of professional development, resulting in an irregular line of advance and suggesting strongly the advisability of consolidating the gains through coordinated action.

At this juncture a new body has been created that coordinates the activities of a number of agencies hitherto working independently in the interests of the engineering profession. The Engineers' Council for Professional Development—ECPD in these days of alphabetical brevity—is the outgrowth of the sporadic thoughts and efforts that have hitherto sought fuller recognition of the professional status of the engineer. Quoting from its charter, the ECPD "is a conference of engineering bodies organized to enhance the professional status of the engineer through the cooperative support of those national organizations directly representing the professional, technical, educational and legislative phases of an engineer's life."

The American Institute of Chemical Engineers is a member of ECPD, having been among the first to ratify the Plan for Joint Action and to approve the charter. In this movement it has been invited to associate itself with the four Founder Societies of civil, electrical, mechanical and mining engineers, the Society for the Promotion of Engineering Education and the National Council of State Boards of Engineering Examiners. Each of these seven national organizations is represented in ECPD by three delegates who elect their own chairman, secretary and executive committee.

In order to carry out a logical program for future professional development, the Council will function through four committees: on student selection and guidance, on engineering schools, on professional training, and on professional recognition. The chronological order indicated in the committees' functions is not accidental, but part of the design. Facetiously the program has been referred to as guiding the destiny of the engineer from the cradle to the grave. But as the plan is unfolded and developed it will be found to contain the answers to some troublesome questions. Who are potential engineers? What kind of training should they receive? What schools are qualified to offer engineering education? What subsequent training should young engineering graduates receive? And finally, who are entitled to the designation of "engineer," and how are they to be recognized?

Careful selection of potential engineers on entrance to college is of the utmost importance to the future of the engineering profession. Hence the committee on student selection and guidance has primary responsibility in the program of ECPD, not only to the student but to the profession as well. It will devise means for the orientation of young men with respect to the responsibilities and opportunities of engineers, in order that only those may seek entrance to the profession who have the necessary high quality, aptitude and capacity. It is quite as advisable to guide unqualified and inapt students away from an engineering career as it is to attract to the study of engineering those who give evidence of special fitness and aptitude.

THIS COMMITTEE will engage in cooperative efforts with other agencies that will aid in the process of selection, such as high and preparatory schools, prefreshman camps, local engineering groups, the Boy Scouts of America, and the National Occupational Council. Aptitude tests will be employed as an aid in picking out those who give promise of profiting from an engineering education, whether or not they ultimately enter the practice and profession of engineering. On the whole the work of this committee will result eventually in discovering the most likely raw material and starting a process of development that will culminate in a finished product worthy of the engineering profession.

The next step in the program is to survey the engineering schools of the United States, and inaugurate a program of accrediting those institutions that are found, upon careful investigation, to offer sound and comprehensive instruction in the major engineering curricula. This activity of the ECPD committee on engineering schools will present no element of novelty to chemical engineers for the A.I.Ch.E. has for the past twelve years undertaken a similar program with respect to the chemical engineering curriculum. A number of schools have been accredited. Others are being studied and assisted in bringing their courses of instruction and facilities up to the high standard set by the Institute.

There has been some difference of opinion among engineers and educators as to the theoretical desirability of accrediting. But the ECPD committee has reached the conclusion that, inasmuch as accrediting of engineering schools by several agencies is already an accomplished fact, it becomes a proper function of the new Council to inaugurate a uniform program of accrediting in such a manner as to be a stimulus to the best development of engineering education. Thus the qualified student is to be assured of opportunity to obtain an education adequate for the practice of engineering.

Following graduation from an engineering school there is a period of apprenticeship for the junior engineer during which he is busy orienting himself to the practical aspects of an engineering career. It is also a period for further personal and professional development through wide reading, social and civic activities, acquaintance and association with older members of the profession. It is in these difficult and important years of the young engineer's life that the committee on professional training proposes to offer aid and counsel. It will encourage self-analysis because, as the committee's report states, "the pace of his (the graduate's) personal, intellectual, and social development at this time will depend on himself. He will establish habits of study and thought, of friendship, and of life that may well be the determining factors in his future." He will be encouraged to develop a concrete plan based on the work in which he is engaged, on his place in the engineering profession, and on his personal preferences and his ambition. Only by following such a plan will he expand his intellectual horizon for recognition as a full fledged engineer.

The crux of the whole program, of course, is professional recognition, which is the province of the fourth committee. In the opinion of the committee, "the profession should establish as the goal of attainment a series of qualifications for which the young man, whether graduate or non-graduate, may successfully strive continuously from the time he enters upon an engineering career." No longer should men be self-styled engineers, regardless of qualifications. For the protection of the public they serve and of the profession they represent, they should earn certification as engineers by meeting certain high standards. Their attainments should be tested by written and oral examinations designed to display scientific, technical, economic, and civic knowledge of a high order. And finally, certification into the profession should be the means by which recognition would be extended to the engineer (a) by colleges in granting the professional degree, (b) by technical societies in extending the privileges of full membership, and (c) by state registration boards in granting licenses to practice.

Such is the future design for engineers as conceived by ECPD. It visualizes the careful selection of potential engineers, their supervised education, intimate contact with the profession and a program of personal development during apprenticeship, and final certification on proof of ability and fitness. The program is an ambitious one, calling for cooperation with technical societies, engineering schools and state agencies, but its sponsor may be expected to proceed with wisdom and caution. As a body responsive to the wishes of its seven member organizations, it will act only on their approval.

Time will be required to put the whole program into effect, but its very formulation brings measurably nearer to accomplishment many of the professional ideals that have found expression in the minds of engineers. Certainly it is the best coordinated effort thus far made to gain for engineers in the future a group identity that will be recognized not only by the profession but also by the public.

WHAT ABOUT the FUTURE of CHEMICAL PRICES?

By EDWARD B. LAUFER

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Three specific influences, according to this author, are likely to make for a long-term trend of declining prices for basic chemicals. These, in the order of their importance, are: (1) supplantive competition, (2) synthesis and (3) the protectionist policies of other nations. So, despite the threat or actuality of inflation, he looks for a decade of progress in which lower cost and improved efficiency will continue to be the industry's greatest incentives for unceasing research and sound chemical engineering development.

EDITOR

REVOLUTIONARY developments in the field of economic theory and the inflationary sentiments now so freely expressed are good causes for reflection on the outlook for chemical prices. Thus far upward adjustments in the markets for basic chemicals have by no means kept pace with the rise in general commodity prices. It is true that certain items, such as metallic derivatives, have moved upward with the market quotations of their respective metals, but, in a large measure, the chemical industry has participated in the broad price rise almost to a negligible extent.

Nor is this hard to understand. The raw material and labor cost of many chemicals does not occupy the importance which these items do in the production, for example, of most foodstuffs, textiles and building materials. Depreciation and obsolescence, maintenance, repair and research expenses are large, and with fixed charges in the chemical industry often constitute a major part of operating expenses. But there are influences of more underlying importance, which have become more manifest during the past decade or so, when technological developments and some inexorable economic laws have exerted their full weight. Factors especially strong in the chemical industry are continually at work and restrain the price of many of its products from moving freely with the undulations of general business. These factors, working from three distinct directions, but meeting at a common focal point, are: supplantive competition, synthesis, and the protectionist policies of nations. These are influences so strong that they might conceivably offset, or go far to offset, the effect of rising commodity prices, motivated by natural or artificial means, on the general chemical price structure.

In considering these three specific influences in the chemical industry, it should be noted, first, that the bulk of chemicals are sold largely on a contract basis to purchasers which consume car-lot or tank-car quantities. Not many of the products find their way into public consumption in their original form, and merchandising is little or no factor in their sale. The products of one large producer are often taken by one large consumer, and research by the purchaser is confined not only to its own products but also to its raw materials, with the obvious desire to keep the raw material cost at the lowest possible level.

Nitric acid is an example of the development of intercommodity competition, one of the most important factors weighing on the price structure. Nitric acid was once made entirely by "potting" sodium nitrate with sulphuric acid, niter cake being produced as a byproduct; but as a result of rapid expansion in fixed nitrogen facilities, nitric acid is now made largely by the oxidation of ammonia. Certain desirable features of nitric acid may yet make it a potential competitor of sulphuric acid for use in, for example, fertilizers, where it has a food as well as a carrier value. So that nitric acid, the production of which once constituted a market for sulphuric acid, was first eliminated as a consumer and now appears as a potential competitor.

The field of synthetic resins is honey-combed with materials. At one time dominated almost entirely by

phenolic resins, this industry is effected by a distinct trend in other directions. Small but increasing inroads are being made by a multiplicity of new substances and, in addition, these new substances are finding uses heretofore undreamed of. A general indication of the trend is manifest by the fact that synthetic phenol resins have been on the decline while others have progressed.

An example of supplantive competition was the substitution of lime for caustic soda in the manufacture of an exclusive chemical, which came at a time when the alkali price structure was none too firm. Other examples —methanol with ethyl alcohol, titanium oxide with lithopone, plasticizers—are too numerous to be recited.

With the development of ammonia synthesis, the world capacity of fixed nitrogen plants has shown a tremendous increase, and a three-cornered battle now exists between synthetic nitrogen, byproduct materials, and the natural product. Nitrogen fertilizers have shown an unmistakable downward trend, and the price of anhydrous ammonia has declined from 30 to 5c. per lb. in a short time.

Butyl alcohol furnishes a typical example of the rapidity with which a product, directed into the right channels, finds its niche in the field of industrial application. An unimportant byproduct in the manufacture of acetone during the World War, butyl alcohol is now a basic chemical. Even the gradual utilization of every conceivable byproduct, in addition to acetone, in its manufacture—corn oil and meal, ethyl and methyl alcohol and carbon dioxide—which permitted price reductions greater than those in its raw materials and which encouraged its use, was not sufficient to prevent the inroads of synthesis.

Even in special instances of chemicals which have had cyclical movements in the past, aside from the mineral compounds, there are trends which may lessen these price swings in the future. Ethyl alcohol is one striking example—fluctuating violently during the past decade, its market movements have shown a correlation with the price of blackstrap molasses. It has one large use—as an anti-freeze. Not only other materials competing for this field but also organic synthesis may militate against a recurrence of the violent swings of the past and may make comparatively stable raw material prices a prerequisite to maintenance of industry's economic standing.

Supplanting Imports

The clamor for protection in time of war as well as in time of peace is reflected in the rapid growth of our coal-tar dye and nitrogen industries. Potash is another industry where the desire to supplant imports is the basis of a great revival.

The success of the United States and Great Britain in their attempts to be self-supporting in coal-tar dyes is generally recognized. By way of review, let it be cited that imports of such colors into these two countries declined from a total of about 90,000,000 lb. in 1913 to less than 10,000,000 lb. in 1930, having, however, increased during 1933.

Nitrogen, not only a peace-time necessity but also an article of war, is still in a period of expansion. Chile, whose sodium nitrate once supplied the bulk of the world's need for nitrogen fertilizers, and whose product was much needed during the World War in the manufacture of munitions, is rapidly outdistanced by a host of competitors. The United States is now not only on a self-supporting basis, but has excess capacity. Surplus ammonium sulphate from countries which have already experienced a growth in their nitrogen facilities has been pressed for sale in this country, with such a disastrous effect on prices that domestic coke companies were for a time trying to retard their own output of this low-priced tonnage line. Curtailment of fertilizer consumption may be a contributing cause, but world over-production, as a result of a very strong protectionist policy on the part of a number of nations, is the underlying force.

The World War, with its curtailment of imports, stimulated the development of potash in the United States. After the bubbles which accompany the speculative stage of many industries had burst, there was sufficient substance on which to develop a small but rapidly growing industry, led by American Potash and Chemical Corp., which until quite recently supplied about 90 per cent of the domestic production. The logical outcome of trying to crowd out exports was a steady decline in potash and borax prices. Now other domestic producers are adding to the annual domestic supply.

Future of Chemical Industry

From the standpoint of world economic, political, and scientific trends, there is no reason to expect that the three influences cited above will be less marked during the coming decade. Capacities are increasing, not diminishing; the trend toward economic nationalism has probably never been stronger; greater incentives to research and develop exist. Under these circumstances, it would seem that little will be accomplished by waiting for a wide cyclical movement in chemical prices to take place with a reversal in business, and with it a reinstatement of such prices as were found in many lines during 1928 and 1929, although some chemicals will be buoyed up by the fact that they are still close to cost of production.

The history of the chemical industry teaches that the early periods of exceptional profit in the manufacture of a new product should be used to write-off equipment as rapidly as possible, since the item of obsolescence and inadequacy is usually greater than the physical depreciation. The extreme here is Commercial Solvents Corp. which has written its butyl alcohol plants completely off its books. Such a policy often gives a cost advantage in the later years when competition is bound to set in.

The best patents have to expire some time, and in anticipation of this, it is better to pass operating economies and raw material savings on to consumers as realized and thus minimize competition, than to forego them involuntarily. Furthermore, declining prices encourage uses and tend to build volume.

Plant efficiency and a sound price policy must be guarded by unceasing research. Present-day synthesis is the biggest argument for the advisability of such protection against the inroads of new methods and new products. Synthesis is slow and sure in its initial stages but often fast and ruthless in its later activities.

Investors in the chemical field may well feel assured that the industry will in the future, as it has in the past, adapt itself profitably to changing conditions, even if it cannot capitalize on inflationary or speculative influences by mounting selling prices.

SELLING CHEMICALS BY CODE

By G. E. CONKLING
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Among codes, that of the chemical industry is almost unique in that its makers have not yet worked out their trade practice and marketing provisions. Fortunately there is less urgent need than in most other important groups. But this is not sufficient reason to disregard the opportunity for gaining self-regulation and establishing even greater cooperation in the interest of both the producer and consumer of industrial chemicals. To assist the industry by focusing an outside viewpoint on its problems, Chem. & Met. has invited an eminent marketing counsellor to analyze trade practice provisions of other codes in their possible relation to chemicals. It is to be hoped that approval of the master code of the Chemical Alliance may be followed promptly by supplementary codes dealing with the industry's marketing machinery.

EDITOR

REPLIES to a recent letter sent to the heads of forty of the largest chemical companies show that NRA activities have not affected the field to date to the extent that other fields now operating under codes with specific trade practices have been affected.

Changes due to NRA activities, at the time of this writing, principally were two. First, costs were raised to a degree. Second, an uncertainty was created as to future prices. The Government's activity towards devaluation was probably more responsible for the latter uncertainty than was NRA. As a result, however, many companies have shortened their periods of commitment. Ninety days' protection is given in cases where normally a contract would apply for a year. Some contracts written for longer than ninety days contain a protection clause under which the supplier can recover any future increased costs due to Government pronouncements. On the other side is the attitude of many buyers to take a chance, preferring the shorter contract at a definite price.

There is an indication that the chemical industries are working toward adjustable contracts. Some companies feel that a variable price may be made, based upon an acceptable index of specific or general conditions. So long as materials are plentiful, however, it is very doubtful that many buyers will smile on such a form of contract. Indications are that they will prefer to take the chance that has been previously mentioned.

Typical expressions of chemical executives on these matters are:

The president of a company producing basic chemicals says: "For the first time in the history of this company the uncertainty of Government activities on business and finance has made us hesitate to commit ourselves for the whole of the coming year. So far we have only committed ourselves to the first six months, except with clauses in the contracts giving us power to revise prices in the third and fourth quarters.

"As regards prices, it would look as though restricted hours and minimum wages would raise our costs. We have adopted the dangerous policy of hoping that increased volume will allow us to maintain former costs. Generally, in our industry, prices have been stabilized at prices which were formerly current, and on only one commodity have prices been raised, because that commodity was very definitely in the red."

The president of a dyestuffs corporation feels that it is a little too soon for definite information. This company is trying to maintain the old prices, but has had to limit contracts to three months instead of a year.

The vice-president in charge of sales of a leading manufacturer of heavy chemicals writes: "Although in a general way we are operating under the labor provisions of the Chemical Alliance Code, we cannot see that, other than increasing our costs, this particular code has any effect on trade practices or ethical activities, in connection with our present contract efforts.

"It is my personal opinion that a great deal can be accomplished by the subdivision codes of the Chemical Alliance.

"I believe that one of the important elements in the

marketing of all chemical products is the relationship between agent, distributor or jobber, and the manufacturer, in the sale of these products to consumers. Wide discrepancies in the methods of procedure of these various intermediaries and the wide variation in handling compensation of such intermediaries, also the reciprocal relationship injected into business by these people, are all items of considerable importance."

The Real Question

It is quite apparent from all of the foregoing that the real question is not what has happened to date, but what future changes in policy will be brought about by possible trade practice agreements written into subdivision codes.

At this writing we can only go so far as to get a clear understanding of what these subdivision codes may permit. As a start, an analysis has been made of the trade practices that have been granted to other industries in their codes, and approved by the President. Unless one has studied these many codes he is apt to be surprised at the practices which the Government has already permitted. It must be remembered that NRA does not suggest trade practices. It has merely approved or disapproved those asked for by an industry group itself, with two or three outstanding exceptions, as price control in the Petroleum Code, on which the Administration took a stand.

So far, NRA has shown willingness to allow industry to try daring experiments. A "five-star" group of these is hard to pick, but the following are some of the most interesting in the writer's opinion:

Reciprocal Buying—Code of American Petroleum Equipment Suppliers Association prohibits buying of customer's product in excess of actual requirements, in order to promote selling.

Allocation of Business—Code of Glass Container Association provides equitable sharing of business (based on production capacity) until total industry sales go over 70 per cent of capacity.

Inter-Product Costing—Code of National Limestone Industry Associated, which prohibits selling below cost, provides that concerns that both quarry (for sale) and fabricate limetone must charge themselves at published prices for block or sawed stone (i.e., at the same prices at which they will sell to another fabricator).

Price Control—Code of American Petroleum Institute *et al* places price control in the President's hands. (The President has not exercised his power at this writing.)

Restricting Increased Production—Code of Glass Container Association provides for registering present production capacity and for a procedure to restrict increases.

Inclusion of a trade practice provision in one code is no assurance that a similar provision will be permitted for any other industry. It is an NRA principle that each industry must fight its own case.

In general, the trade practices which have been approved in other codes, and which may be of interest to the chemical industries, fall into the following groups: (1) Selling below cost; (2) open-price selling; (3) limiting production; (4) price-fixing; and (5) miscellaneous.

Selling Below Cost—A provision barring selling below cost is included in about 75 per cent of the codes approved to date.

Selling below cost requires cost definition, a problem more intricate in the chemical industries than in others.

The codes of many industries merely state that a standard basis for cost accounting is to be worked out, either by the industry or by the code authority. In a few cases the basis is laid down in the code. Of all of these codes, that of the National Paint, Varnish & Lacquer Association is the clearest and most complete as to costs; the Lumber Code perhaps second. The costing provisions of the Paint Code provide specifically

TRADE PRACTICES SCORE BOARD FOR CODES OF CHEMICAL AND RELATED INDUSTRIES

Industry group	Bars selling below cost	How costs are to be determined	Permits or provides open price selling	Important special trade practices
Codes approved by the President prior to 1-1-34				
Hardwood distillation	×	Code authority to prepare uniform system of accounting		Bars guarantees against price declines. Prohibits special allowances etc.
Soap and glycerine manufacturing				Trade practices to be studied and recommendations made by code authority
Rubber manufacturing	×	Each division to adopt Association Accounting Manual		No secret rebates or favors
Oxy-acetylene				Bars use of competitors' containers, etc.
Paint, varnish and lacquer manufacturing	×	Code defines costs		Burden of proof in complaint on selling below cost rests on accused. Distributors must conform to trade practices of code
Fertilizers	×	To be prescribed by Fertilizer Recovery Committee	×	Provides way to limit production. Bars guarantees against price declines. Provides for zone operations. Grades may be limited
Photographic manufacturing			—	Future trade practice regulations are contemplated
Salt producing	Modified	Can sell at current cost of lowest cost producer in zone. Code committee to work out uniform accounting	×	Code committee may reduce minimum prices
Rayon and synthetic yarn				Trade practices to be considered in future
Trade practices requested in codes submitted but not approved prior to 12-27-33				
Chemical manufacturing			×	Permits open price selling and special trade practices by subdivisions
Explosives				Provides for future trade practices
Cement	Modified price fixing		×	Asks for allocation and production control
Matches	×		×	Complete regulations for distribution of product
Carbon black			×	Can meet lowest published price. Production limited to sales.
Cast phenolic resins				Trade practices to be studied

that costs shall include the following items: Market replacement cost of material manufactured within the industry as determined by the code authority, plus total delivery replacement cost of other materials not covered by the authority; cost of containers and packages; cost of processing, involving direct cost plus depreciation in accordance with income tax provisions; plus proper share of indirect factory expense, except interest on investment (allocated to each product based on an average rate of utilization of active plant; a share of general and administrative expense, determined by the authority, and submitted to the Administrator for approval; transportation charges when goods are sold f.o.b. destination.

This code also states that burden of proof of any complaint of selling below cost rests on the accused manufacturer.

The Lumber Code similarly is specific as to cost items.

The Asphalt, Shingle & Roofing Institute Code defines cost as direct material, transportation and shrinkage, direct labor, power, factory overhead and maintenance expense, warehouse and factory shipping charges, plus an additional 15 per cent of these items (apparently a minimum allowed for sales and executive and administrative expense).

The code of the National Crushed Stone Association *et al.* defines cost as minimum plant cost, plus 10 per cent.

The Government is understood to be working on definitions for cost items. When completed these are expected to be substituted in existing codes.

The specific problem which selling below cost would bring into the chemical industries is the definition of cost of material when such material is manufactured by the same company that converts or fabricates it into a further product. This becomes a particular problem when the company selling the converted or fabricated product also sells the raw material to another company, which in turn thus becomes a competitive fabricator.

Two codes now specifically provide that in such cases the manufacturer must charge himself for raw material at a market replacement cost, or at the same price at which he would sell it to another fabricator. These are the National Limestone Industry clause, previously quoted, and that of the National Paint, Varnish & Lacquer Association, in which, both in its definition of cost for lacquer thinners and for other products, the same conditions apply.

A similar principle for costing has been asked for in other codes not yet approved.

It is the writer's belief that selling below cost cannot be applied in any chemical subdivision, without considering this point.

Open-Price Selling

The open-price system is either permitted or specified in many codes. Usually the plan is for each manufacturer to publish prices, and to be obligated to sell at these prices until a given number of days after he files new prices—ten days is the common period. The manufacturer has full and free right to determine his own prices, and to change these as often as he wants, so long as the proper period of notice is given. The provision is modified to meet conditions in some industries.

In the code of the Copper & Brass Mill Products Association, which provides for open-price selling, the industry also establishes open-price buying. Each company is to publish lists of the prices which it will pay for scrap, and these may not be violated.

Open-price selling is apt to cause a temporary period of confusion when adopted by an industry. The early tendency is for individual manufacturers to sharp-shoot at big orders. They may file a change in price, with a special contract in view. The association secretary's desk becomes loaded with price changes, and he has difficulty in getting these out to the industry fast enough. Experience in industries which have practiced open-price selling indicates that this condition blows itself out after a period. A producer finds that the effort spent in sharp-shooting is not worth the game secured. He finds it more profitable to spend his time on the development of his market in general, with the security given by open-price selling as a foundation for more intensive marketing effort.

To many companies in the chemical industry open-price selling is a radical change in policy. It eliminates the special negotiating which has been common. Open-price selling distinctly has pluses and minuses to the individual seller, and should be talked out before being tried.

Price fixing and price maintenance are both permitted in certain codes. The code of the American Petroleum Institute *et al.* places price control directly in the hands of the President. The Bituminous Coal Code allows a fair minimum price to be established by a marketing agency or as the code authority may direct. However, two-thirds of the tonnage of any district is to be represented in the setting of a price for the products of that district.

Codes for pumps and heat exchangers permit the supervisory agency to fix a fair price under conditions, at the agency's will. Several codes which do not go

Sales Below Cost Specifically Paint, Varnish & Lacquer

PRODUCTS of The Industry shall not be sold at less than cost as herein defined:

(1) The cost of Lacquer Thinners in full tank cars or tank wagons containing not less than one thousand gallon quantity, when sold and delivered to one purchaser, shall be not less than the sum total of the current market replacement price of each and every ingredient in the completed Thinner.

The cost of all other products shall include the following:

(2) The seller's total market replacement cost of raw materials (based on cost furnished monthly, or oftener if necessary, by authority of the Paint Industry Recovery Board through Association Headquarters, subject to approval by the Administrator); and if any raw materials are used (such as varnishes, japans, driers, etc., purchased in finished form by the seller) for which costs are not furnished monthly or oftener, as herein provided, the cost used for such item or items shall be the seller's total current delivered replacement cost.

(3) Containers and/or packages.

(4) Cost of Processing.—To include all direct costs (such as power and labor), depreciation figured in accordance with provisions of the Federal Income Tax laws, plus a proper proportion of all indirect factory expenses (excepting interest on in-

Banned in the Code of the Manufacturing Industry

vestment), in accordance with the share each product should bear, provided that the distribution of indirect factory expense per unit of production shall be on the basis of the average rate of utilization of plant facilities of profit making producers during the years 1928 to 1932 inclusive, and provided that such average rate shall not include any plants not in operation.

(5) There shall also be included in the cost a proportion of the general and administrative expenses, such proportion to be determined and to be recommended by the Paint Industry Recovery Board to the Administrator for approval.

(6) Transportation charges when goods are sold f.o.b. destination.

In the case of any complaint by an interested party that a manufacturer is violating the above cost provisions the burden of proof of compliance shall rest upon the accused manufacturer. If the Code Authority or the Administrator is not satisfied by the proof furnished by the defendant manufacturer the matter is to be referred to the Federal Trade Commission who shall audit the cost accounting of the defendant and review his allocation of burden; and the report of that Commission shall be final regarding the costs of the defendant manufacturer.

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as far as price-fixing do, in effect, cover price maintenance. This is usually accomplished by a clause which demands that members who sell to distributors or jobbers can only sell to those who have agreed to sell in accordance with the code. In these cases the codes contain open-price clauses.

Restrictions on Production

A variety of provisions have been approved. One group of codes limits the hours of machine operation, a situation obviously not practical in most chemical industries. Productive hours are limited to as little as 27 hours per week by the Cast Iron Soil Pipe Association, and to as many as 120 hours per week in some of the affiliated textile groups.

Restrictions on new productive units in the field are definite in several codes. A provision of the Glass Container Association has been noted. The code of the National Association of Ice Industries requires approval of the Administrator before new production capacity is established. The code of American Iron & Steel Institute prohibits certain new capacity. The Petroleum Code provides for the development of new fields only by the President's approval. A specific procedure is named in the code of the National Crushed Stone Association, National Sand & Gravel Association, and National Slag Association, which provides that on recommendation of any state unit the regional committee can demand that notice of intent be filed for any new production capacity, and is given authority to deny any application that may be made for such additional production capacity.

In the chemical industries the question of production capacity is intensified by byproduct production. Furthermore the importance of the industries for national defense must be considered. A neat problem is thus built up for many of the subdivisions.

Consignment selling is barred in upwards of 20 codes. Several codes bar guarantees against price declines or advances. The code of the Wood Chemical Institute is an example, in which such a provision is clearly stated.

Two other miscellaneous trade practices which may be presented without comment, are:

1. Prohibiting sale of product except in certain industry grades or sizes. The code of the Tile Manufacturers Association establishes limits of sales for second-grade tile.

2. Prohibiting raiding of trade areas not normally sold. The code of the Embalming Chemical Manufacturing Association *et al.* carries a restriction under which a manufacturer must operate when selling outside of his normal territory.

A summary of codes approved to date would not be complete without mentioning the "no partnership" clause approved in the code of the Asbestos Institute. "Nothing contained in the code shall be deemed to constitute any of the members thereof partners for any purpose. No member of the code shall be liable in any manner, by reason of his participation therein, to any one, over any act of any member or agent of the Code Authority."

In general, the experience of the chemical industries with code operation lies ahead as subdivision codes are developed. Evidence from codes already approved shows that chemical industries may hope that NRA will permit any reasonable trade practice which a group requests in working out these subdivision codes.

Finally, it must be noted that there has been some feeling among members of the chemical industries that helpful trade practices should not be asked for, as these might bring retaliation from the Government later, in the form of limitation of profits or increased taxation of profits. Such a question is beyond the scope of this article, or of this writer. It may fairly be said, however, that most industries now operating under codes like their trade practices. On the other hand consumer claims of unwarranted price rises will force proof that future trade practices are in public interest.

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NEW LABOR PROBLEMS

(*Concluded from Major Eckel's article on page 15*)

In this emergency it was a distinct pleasure as well as a surprise to find that the technicians of certain grades and in certain industries were preparing to supply more direct and clearer-minded representation. Looking at the results from my own necessarily detached viewpoint, my judgment is that in a far larger number of cases the employees would have willingly granted even broader protection had any permanent organization appeared as a proponent for such advanced ideas.

So it appears that in the new organization of industry our technical workers must be prepared to protect themselves. And in the set-up which is offered us, this almost necessarily involves the formation of actual unions of technicians, working in close association with the ordinary unions of skilled workers of other sorts. It is not by any means in ideal solution. It seems, however, to be the only solution open today under the New Deal.

WHY PACKAGE CHEMICALS?

By E. SCOTT PATTISON

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New York, N. Y.

Chemical manufacturers in general have shied away from over-the-counter selling despite several notable successes in marketing trademarked specialties directly to the ultimate consumer. The past few hard years have demonstrated the advantages in bridging the gap between so-called producer and consumer goods. To reach the latter market involves entirely new problems, not the least of which is the question of packaging chemicals. When? Why? How? This author's first observations were in the food field but he is now connected with the successful marketing of several packaged chemicals. His answers to these questions make engaging reading.

EDITOR.

IT HAS almost become a tradition to begin every article on packaging by contrasting the old-time grocery cracker barrel with the polychromatic pyramids that conceal the clerks in the modern grocery store. Then come the traditional generalizations about eye-appeal and convenience, illustrated by an old package and a new, and backed up by figures to show what the change meant in added profits to Company X. About Company Y, which went broke despite a supreme achievement of package designers' art, the traditional article seldom speaks.

Valuable as "stories of successful packaging" may be in publicizing those who developed the design, they are a constant source of confusion to people whose basic problem it is to determine whether a product needs packaging at all, or simply a serviceable means of transporting it to the consumer in the condition he expects. It is interesting to know, for example, that red has more eye-appeal than purple—it may make or break a candy package—but a chlorine cylinder with a red ribbon around it is hardly a vital improvement on one beribboned in purple.

A great deal of such confusion can be eliminated by setting up in our minds this useful, if somewhat arbitrary, distinction between containers and packages:

A container is a sales necessity. (The storekeeper buys a paper bag to put your oranges in because he knows that you would refuse to take them home in your pockets.)

A package is a sales instrument. (The storekeeper buys a basket, a ribbon, and a sheet of Cellophane for his oranges believing that the additional expenditure will be justified in added appeal of the unit to you, or to someone else who hadn't been thinking of buying oranges at all.)

The package costs more than the container, because it has additional functions as a sales instrument to perform. It may emphasize the individuality of a unique product, or create a sense of individuality for an unexceptional one; it may take advantage of trade-name consciousness; it may serve as a link between the product and advertising; it may connect the good-will of one product with a family of products; it may attract new purchasers by its appearance, or by the mere fact it is out in sight as he contemplates purchase; it may retain old purchasers by its convenience in storing, in opening, and in consumption, or by its reuse value.

If economic justification for these functions does not exist under the conditions governing the sale or use of the product, the most modern package design cannot justify itself. If, on the other hand, there is a real need for the functions that packaging can perform as a sales instrument, generalizations and limitations that hold for containers must be discarded then and there. Packaging costs, like advertising costs or the costs of keeping salesmen on the road, must be judged by sales results.

Foremost among the functions of packaging as a sales instrument are its possibilities in emphasizing the individuality of a product, real or superficial, at the point of sale or the point of use. As a result, decisions as to the

worth of packaging are often confused with the more basic decision as to the worth of promoting product individuality. In the case of many standard chemicals sold under their generic names, the basic question usually is not, "Shall we package it?" but "Shall we attempt to create for it some special significance in the minds of purchasers?"

The first question must be: "Will our product's inherent individuality, or some sense of individuality we can create, have a sales value commensurate with the cost of maintaining consciousness of this individuality in the minds of prospects and purchasers?" If the answer is yes, then we are justified in going on to determine to what extent packaging can help attain this end.

If we are establishing this individuality by advertising, for example, we must consider how effectively the package serves as a connecting link between advertisement and product. If the man who reads the advertisement is the man who handles the package, the link may be a vital sales function. If the man who reads the advertisement never sees the package, it may be no link at all.

If our product has patent advantages for use, we must decide what function the package can perform in getting a consciousness of these advantages into the minds of users. On the hardware-store counter, product individuality and package individuality may be closely related. But in developing consciousness of unique features in the mind of a purchasing agent in New York for a product that goes to the rear door of a plant in Newark, to be handled by a laborer who cannot read English, packaging as a sales instrument has a value of zero.

Similarly, the function of the package in blending good-will for a family of products may be great when the related products are bought at retail by the same purchaser; or it may be worth little when the related products, like mineral oil and motor oil, move into divergent fields of use.

The value of eye-appeal of the package at the point of purchase has obvious marketing limitations. Though eye-appeal has made bedfellows of cellulose chemistry and psychological research, it is simple in its economic aspects compared to the sales value of packaging from the standpoint of convenience in use. The manufacturer of a candy-bar or cosmetic can test the instinctive decisions that people make under the same conditions of purchase. The manufacturer of a packaged cleanser who attempts to analyze the economic justification for an easy-to-open can, however, must attempt factual determination of the relative importance to a purchasing agent of a ten-cent saving and the blessings of the janitor who has to open the can.

Primarily, of course, it is the market for the product, and the channels by which it moves to that market, that determine to what extent packaging can perform valuable sales functions. As a result, there is a confusing tendency to discuss the pros and cons of packaging when the fundamental question concerns the desirability of extending markets from "paper-bag" purchasers into new fields where the functions of the package as a sales instrument are clearly necessary.

To say, "With an attractively packaged product, we would have more chance for expanding our sales in such-and-such a market," is not so much an argument for packaging as it is a case of putting the cart before the horse. Rather the point is: "Do we want to attempt expansion of sales in such-and-such a market? If we do, we must plan a package to help secure it."

We must keep in mind where people buy the product, why they buy it, how often they buy it, how much of it they buy, how important the purchase is, how likely they are to try something else. We must consider who specifies its use, who uses it, who judges the results of using it. We must remember who sees the package before it is used, who sees it while it is being used, what happens to the package after it is emptied.

Only by considering all of these factors can we reach some indication as to just how far packaging costs can logically go beyond the basic requirement of containing the product. All too often, after the necessity for packaging, as we have defined it, has been admitted, packaging costs have still been treated as a sales necessity, rather than a sales instrument. Such a compromise between the package and the paper-bag point-of-view usually results in something extravagant as a container, yet failing as a sales instrument—the kind of thing that justifies the complaint of production men about "the money we're wasting on this fancy package," whenever economy is mentioned.

It may be that advertising is the best way to a profitable increase in sales, it may be price reduction, or putting more salesmen on the road. *It may also be packaging.* A package becomes "fancy" only when money is spent for elements that cannot justify themselves in sales.

Rubber Tire Industry's Position Shown

IN HIS recommendations to President Roosevelt concerning the Code of Fair Competition of the Rubber Tire Manufacturing Industry, which has just recently been approved, General Johnson cited data to show the present and recent past conditions of the industry. In 1929 sales were $675,000,000, compared with a decrease of 55 per cent to $300,000,000 in 1932. Production of casings was 69,000,000 in 1929, compared with 40,000,000 in 1932, a decline of 42 per cent. In the former year the industry employed 74,700 wage earners, and 48 per cent less, or 38,800, in the latter. During the same period, the number of companies decreased from 62 to 35, or 44 per cent fewer.

That the industry made the wages and hours provisions of the code effective long before the code went into effect is indicated by the accompanying table, which shows that while October production was only 65 per cent of May, employment nevertheless increased over 30 per cent and hourly wages about 17 per cent. It is true, however, that average hourly earnings per week decreased with the last quarter seasonal decline.

Production, Wages and Hours in Rubber Tire Manufacturing Industry, May-October, 1933

(Source, National Recovery Administration)

1933	Production, Casings	Wage Earners	Avg. Hours Per Week	Avg. Hourly Earnings
May	5,200,000	38,545	38	$0.585
June	6,100,000	44,148	42	0.579
July	5,700,000	49,680	38	0.620
August	5,000,000	52,962	32	0.654
September	4,000,000	52,850	30	0.681
October	3,400,000	50,400	31	0.688

NEW DEAL IN AMORTIZATION DEPRECIATION AND OBSOLESCENCE

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The day is past when the engineer could afford to go blithely on his way without regard to the management, economics or accounting of his chosen interests. Now that business is being regimented, more than ever before we must avoid the pitfalls of faulty thinking in cost determination. As Professor Fiske demonstrates, some of these are not fully understood, even by certain trained accountants. And yet, as he shows, simple and logical rules govern the handling of even the most intangible of the elements that go to make up the cost of production.

EDITOR

DECLINING prices, plus unsatisfactory volumes, new developments and inventions, and drastic changes in style and in engineering aspects of product have all occupied a central position in the industrial picture during the last four difficult years. Now the National Recovery Act adds the possibility of prorated and limited production, and makes pointed reference to the unsoundness, unfairness, and possible illegality of selling below cost. Manufacturers are being urged to modernize methods and plants as a part of the "by now" campaign. All of these problems affect the manufacturer's equipment policy and are reasons for a careful reconsideration of such policy. Recent trends in price levels, plus the national administration's attitude in regard to the desirability of further increases and the recent enactment of an excess profits tax, have probably put an end to the wave of write-downs which swept the country during the past year and a half. Other problems of equal importance remain. What is "cost" so far as equipment is concerned? How will manufacturing cost be affected by possible proration of production and by obsolescence arising from new inventions and change of products and processes? To what extent should new equipment be purchased to replace old? Where is the money coming from? These and other questions must be solved correctly if the enterprise is to prosper.

A sound equipment policy must be based upon a foundation of accounting and financial concepts and relationships. These concepts and relationships should be a part of the working equipment not only of management, which must make the decisions, but also of all those concerned with any aspect of the problem. In particular the engineering profession, which will design equipment and initiate suggestions as to new methods and processes, should have a complete understanding of these fundamentals, in order that designs and suggestions may stand the test of business practicability.

The object of all business enterprise is profit, and the determination of net income or profit is one of the major tasks of every accounting department. Although the only strictly correct definition of business net income is "an increase in net worth resulting from any cause other than new investments by proprietary (owners') interests," the more common definition and method of determination is the balance of income remaining after deducting from gross income all expenses, including items accrued but not paid. An important element in equipment policy is the provision for inclusion in expenses of proper amounts to cover costs arising from use of plant and equipment.

Expenses consist of goods or services utilized in production and sale of the goods or services sold, as well as those utilized in financing and administration. Expense includes all values given up in the exchange transaction which we call the sale; they include not only the goods sold but values expended in making the sale. A business is composed of five elements: (a) a place to work, (b) machines and tools, (c) men, (d) materials,

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and (e) management. Costs are thus outlays for shelter; for machines (royalties or taxes, insurance, depreciation, repairs, and power); for labor; for materials; for management; and for borrowed capital.

There is no necessary relation between cash expenditures and expenses. While most expense items are offset or represented by practically coincidental cash expenditures, some important ones may arise from quite different sources. Goods or services may equally well be purchased with credit or non-cash assets. Goods or services used up in business operation may be purchased either at the time of use or well in advance. Materials, insurance protection, shelter, and machine operations are commonly bought in advance as inventories, prepaid insurance policies, buildings or leasehold rights and machinery or prepaid royalties. Payroll, purchased power and such items are ordinarily purchased as required.

The accountant assembles expenses from three sources. (1) The majority represent purchases for immediate use, billed as shipped and paid for within ten days to one or two months. (2) Some items, like bond interest, taxes, and book royalties are payable only at considerable intervals and are not billed as used. Expenses of this type must be accrued; that is, both the expense and the future obligation must be recorded in order that the cost may be included in the profit and loss statement and the liability in the balance sheet. This group is referred to as accruals. Both groups are made up of items bought as used; the distinction lies in the custom of billing and payment. (3) The third class includes expenses arising from utilization of goods or services bought in advance of requirement. An example is fire insurance which is bought in advance of protection. The cost of such protection is an expense for the period during which it is received regardless of when or how it is paid for. The utilization or expiration of such prepaid expenses must, like accruals, be recorded if profits and the balance sheet are to be correct.

All assets except cash, cash equivalents, receivables, investments, and land used merely as a location for an industrial enterprise eventually become expense as they are used. Inventories, prepaid insurance, buildings, machinery, and equipment are all prepaid expenses. These assets differ only in the rapidity of utilization in production and distribution. Materials are ordinarily completely used up in a single cycle of business operation. Buildings, machinery and equipment, on the other hand, provide service for a period in excess of one operating cycle. This difference in rate of utilization does not change the essential nature of both inventories and plant as prepaid expenses ultimately to be charged as expenses of the accounting period benefiting from the service rendered.

The process of apportioning these various prepaid expenses to the period benefited is variously referred to as amortization, depletion, and depreciation according to the type of asset (prepaid expense) involved. The term amortization is used for such intangibles as prepaid interest, prepaid insurance, and prepaid rent and leaseholds. Depletion applies to wasting natural resources, as mines and oil wells. Depreciation is used where physical plant is involved. All refer to the process of apportioning prepaid expenses to the proper accounting periods. It should be noted carefully that if the accounting period were increased in length to the life of buildings and machinery, capital charges on the one hand and amortization, depletion, and depreciation on the other would all tend to disappear since machines and buildings completely consumed within the accounting period would become expenses of the period and would be charged as such at the time of purchase. Capital charges, and amortization, depletion and depreciation thus become necessary as means of apportioning the cost of productive capacities to the periods actually benefited.

Most business men accept without question the necessity of prorating the cost of prepaid insurance policies over the periods during which the protection is in force. Likewise there is necessity for amortizing prepaid rent or interest, the cost of leaseholds or bond discount. Patents represent prepaid royalties, the cost of which must be charged to the product benefited. Amortization is the term applied to the process of charging to each accounting period proper portions of the original amount of intangible prepayments of the type indicated above.

Depletion is essentially the simplest of the three concepts. Mines and oil wells are bought on the basis of estimated ultimate yield. The removal of every ton of coal or barrel of crude oil leaves a smaller quantity still to be recovered and a charge must be made to expense for the depletion of the reserves.

The intangibility of such assets as leaseholds and patents has caused much false reasoning. Likewise the very physical definiteness of buildings, machinery and equipment has been an important source of misconceptions. The concept of a building, machine or piece of equipment as capacity for so much shelter, for so many operations or for so much service is of assistance not only in determining an outlay to have been for an asset as opposed to an expense item, but also in understanding the concept of depreciation. Thus an outlay for a truck is in reality an outlay for so many ton-miles of transportation rather than an outlay for a physical object.

The use of buildings, machinery and equipment gives rise to two forms of special expense directly attributable to these items, repairs and depreciation. As to these items there has been, and still is much loose thinking and general misunderstanding. The basic reasons for most of this are failure to appreciate the fundamental nature of the plant item on the balance sheet as prepaid expense, and to appreciate that the purchase price is in reality given in exchange for a definite service capacity, rather than for a material object answering to certain specifications. As soon as these concepts become clear it is fairly obvious that such a prepaid expense must ultimately be apportioned to the periods or production benefiting, until finally the total cost shall have been charged to operations. Depreciation is cost of expired plant capacity.

Much of the misunderstanding has also been due to defining depreciation as a loss in value. This definition emphasizes dollars rather than productive capacity and unfortunately suggests a relation between depreciation and market value. Depreciation might be defined as a loss in service value or service capacity. The necessity for a common denominator in accounting records forces the accountant to reduce this loss in service value to dollars; the basis of determining dollars of depreciation is ordinarily cost rather than market value of the service capacity used. Market value is a factor only to the extent that at the date of original purchase it coincides with cost and that at the date of retirement it determines scrap or recovery value. The total amount to be amor-

tized or depreciated is the difference between original cost and scrap value at date of retirement.

A further cause of general misunderstanding is the tendency of some writers to confuse depreciation with loss in engineering efficiency when it is rather a charge representing the utilization and consumption in business operations of a portion or all the service capacity of plant items, just as material cost represents the utilization and consumption in business operations of material.

Depreciation, or expiration of service capacity, may arise from several sources. The most commonly indicated source, wear and tear is seldom the governing force. Any force which will result in the withdrawal of a plant item from use is a depreciation factor. The force which results in withdrawal at the earliest date is the governing force in any case. Wear and tear is seldom that force since other causes usually operate to cause retirement before wear and tear cause such a loss in operating efficiency as to make retirement necessary. Wear and tear always determine maximum capacity of the plant; all other forces tend to reduce the potential capacity and thus the serviceable life. Two factors other than wear and tear also determine the physical life of plant. These are deterioration and damage or accident. Accidents may result in irreparable damage. They may all to some extent be avoided by proper care or remedied by repairs or rebuilding. Avoidance or repair in any case becomes at some point uneconomical because of the action of non-physical forces which makes retirement necessary regardless of material condition. These non-physical forces combine to create a condition of obsolescence.

Obsolescence Independent of Physical Forces

Obsolescence may be defined as a loss in serviceability due to the action of economic or technological rather than physical forces. It is thus a special case of depreciation. Many conditions will render plant obsolete. Among them are the discovery of new and better ways to do things, changes in the nature of business, changes in the style and design of product, and competition (changes in the relative cost of labor and capital which may make new labor-saving equipment profitable or may render the present equipment uneconomical). When any one of these conditions arises, the service capacity of the plant in question may become zero and justification for its presence on the balance sheet disappears. The purchase price, less scrap value, is a cost of product already obtained and should have been fully depreciated.

Some authors take the position that depreciation and obsolescence are fundamentally different. The previous discussion is intended to show that this position is untenable, since obsolescence covers an important part but still only part of the causes of loss of service value which we call depreciation. The physical and non-physical causes of depreciation unite to determine the service life of plant, the factor first requiring retirement being the dominant cause in any given case. In some industries and for certain types of equipment, wear and tear through use are regularly determining service life; in other industries and for other equipment some one of the economic or technological forces resulting in obsolescence is the determining factor. Whatever the cause of retirement, the original cost less recoverable scrap must be charged to the product obtained during the serviceable life—in every case a depreciation charge.

Various methods have been suggested for handling obsolescence as alternative to including it as an element in the depreciation charge. These alternatives are unsound because they fail to recognize that, like physical wear and tear, obsolescence is a factor in cost of production and should accordingly be included as an expense and a factor in cost. Obsolescence, like depreciation, can seldom be estimated accurately. At the time of retirement the reserve for depreciation will almost certainly be either too large or too small. The excess or deficiency is a measure of the inaccuracy of the estimate and of the over- or under-statement of expense during the serviceable life of the equipment. Correction of the error is always necessary and should be made directly to surplus; if the amount is small the error made by correcting through profit and loss will be small. Except for such corrections of inevitable errors obsolescence cannot be adequately handled, other than by inclusion as an element in the annual expense as a part of depreciation.

The close relationship between repairs and depreciation has already been suggested. Even brief consideration will show that the economic life of equipment is definitely affected by repair policy and vice versa. Where conditions in an industry are sufficiently stable that obsolescence becomes an unimportant factor in determining serviceable life, the useful life can be considerably extended by a careful repair policy. If obsolescence is likely to retire the machine within a short period of time, repairs may be practically avoided in order to work out the machine in a minimum of time. When a serviceable life has been decided upon, it must always be with a definite assumption as to repair policy. All expenditures made thereafter with a view to obtaining the estimated useful life will be repairs, and only expenditures which will increase the length of life or increase the rate of output can be considered as an addition to assets.

Many bases for computing depreciation have been and are used. Theoretically the most sound method is a charge per unit of production. Such rates are used for trucks and tires and in steel plants. The difficulty is to estimate with reasonable accuracy the probable production during the economic life of the equipment. The frequency with which obsolescence rather than wear and tear causes retirement, plus the uncertainties of the business cycle, have led business men to use a time basis as the surest way to completely depreciate the plant cost by the time of its retirement. Uniform production is arbitrarily assumed and the total cost to be amortized is divided by the years of expected useful life to determine annual charge-off. This so-called straight line method of depreciation is open to the objection that the years of bad business are penalized while years of good business are benefited. This cannot be avoided except by the use of a production basis. Any attempt to base depreciation on income is unsound because profits and production cannot be expected to show perfect correlation; and because the method would omit depreciation entirely in years in which there were losses.

Amortization, depletion, depreciation and obsolescence in terms of accounting analysis are all asset decreases offset by expense or net worth decreases.* In the case of amortization, the asset decreased will be Prepaid Interest, Leasehold or other intangible asset; for depletion

it will be Mines, Oil Reserves, or other wasting asset; and for depreciation and obsolescence it will be Buildings, Machinery or Equipment. Handled in the simplest possible manner on the balance sheet each would result in a decrease in the appropriate asset account (representing the expiration of prepayment of expense) and a decrease in the surplus section of net worth.* Each asset involved would gradually decrease until it finally disappeared from the balance sheet. This method is generally used in the case of amortization only, while a somewhat different method, to be described in the next paragraphs, is practically universally used to record the effect of depletion, depreciation and obsolescence.

At least four considerations make desirable the saving of original plant cost figures. The first is the fact that depreciation rates are commonly based on original cost so that the retention of cost figures is helpful in determining annual depreciation figures. A second, and important consideration, is that if depreciation credits are excluded from the plant account, all other changes in the account will reflect actual changes in the physical volume or capacity of plant. A decrease in the plant account can then be interpreted as an actual excess of retirements over additions and betterments, and an increase can be interpreted as an excess of additions and betterments over retirements. Further, if depreciation credits are segregated it will be possible to consider the adequacy of accumulated depreciation in relation to plant, and finally the fact that depreciation is necessarily an estimate will be emphasized.

For the reasons just outlined, it is usual to segregate the depreciation credits to plant in a separate account, commonly titled "Reserve for Depreciation." Because a portion of the credits to Plant have been so segregated, it is necessary to subtract the Reserve for Depreciation from Plant to determine the net value of Plant.

The nature of the Reserve for Depreciation is understood by relatively few persons outside those who have had accounting training. Two important reasons largely explain this misunderstanding. The first is an unfortunate terminology which uses the word "Reserve" to cover several fundamentally distinct concepts, and the second is a tendency to confuse the two aspects of the depreciation transaction with the normal financial effect of including depreciation as an expense item. If the origin of the Reserve for Depreciation is kept in mind its nature will be clear. The Reserve is merely a segregation of a portion of the decreases in Plant; it represents plant which has been consumed in operations, as opposed to plant which has been sold, scrapped or otherwise disposed of.

When the accountant records cost of goods sold as an expense and reduces inventories by the same amount, he does it to indicate that of the sales price (represented by cash or accounts receivable) an amount represented by Cost of Goods Sold is only an exchange of goods for cash (or receivables) and must be kept in the business to replace the goods sold. Unless that amount is retained, the capital has not been maintained. Depreciation, included as one of the expense items, assures the retention in the business, if it at least breaks even, of assets equal to the cost value of expired plant. The availability of those assets to meet replacement requirements depends on the use made of the cash and receivables taken in the sales transactions. In the sense, then, that all expenses indicate the necessity of retaining in the business an equal amount of assets, depreciation provides assets of the right amount but not necessarily of the right form to replace expired plant.

Replacement Funds a Financial Problem

Considerable discussion has centered about the problem as to whether assets retained in the business through inclusion of depreciation as an expense should be segregated in a replacement fund. The object of such segregation is assurance of liquid funds for use in replacing plant. This is a financial, not an accounting problem, and its solution depends on understanding normal financial relationships involved. During the early years of any business enterprise replacements will be relatively small. As the years pass, replacements will increase until in a stable business they will tend to equal in amount the annual depreciation charge. In businesses characterized by a few plant items of large value, annual replacements will not be uniform but are likely to be either very high or very low. The larger the enterprise and the greater the number of plant items the more nearly uniform will be replacements. Further, no plant is ever maintained in a state of complete newness. Successful operation can be carried on in a plant on which there is accrued depreciation of 15 to 35 or 40 per cent of original cost. This is true because each plant item should be retired as soon as its operation becomes uneconomical; at the time of retirement the Reserve for Depreciation applying should equal 100 per cent of cost. During the early years of operation before replacements reach their maximum, a considerable reserve will have been accumulated against all plant. This reserve will reach a maximum and remain approximately constant as soon as annual replacements equal annual depreciation.

The effect of this average replacement experience is that if the policy of setting up a replacement fund is adopted at the inception of the business, the fund will increase (since depreciation will exceed replacements) to a maximum and then remain practically constant as long as the business is stable (since the maximum will be reached at the time replacements equal depreciation, a condition which will continue thereafter unless the business expands further). Thus the net result must be that the average replacement fund is of no use and the segregation of assets in such a fund renders those assets sterile. The normal flow of funds will ordinarily provide for replacements. Only in cases where abnormally heavy replacements require financial planning will a replacement fund be of assistance. The object sought from a replacement fund can usually be equally well obtained through financial budgeting without tying up funds in low-earning assets. The assets retained through depreciation charges in the early years of business operations provide a satisfactory source of funds for expansion since, as has already been pointed out, such funds will never be required for replacement.

* To the extent that any of the year's production remains in the merchandise inventories the portions of amortization, depletion, depreciation and obsolescence representing cost of that production must be analyzed as asset (inventory) increases.

NITROGEN INDUSTRY MOVED AHEAD IN 1933

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WORLD production and world consumption were reasonably well balanced in 1933 at a level of about 1,700,000 metric tons of nitrogen, which however is less than 50 per cent of the total productive capacity for all forms of nitrogen, about 80 per cent of the peak 1929 production, and nearly 90 per cent of the peak 1929 consumption. Financial results of a few companies in 1933 were fair, considering the drastic reduction in the price of all forms of nitrogen since 1929; however, the greater proportion of the industry unquestionably is by no means "out of the woods."

World production and consumption of nitrogen for recent fertilizer years, ending June 30, 1933, are shown in Table I, which represents estimates by the British Sulphate of Ammonia Federation, Ltd. Analysis of these figures reveals some startling changes over the relatively short period of three years, that is, comparing the fertilizer years 1929-30 and 1932-33. The increase in production of all forms of nitrogen in 1932-33 was about 5 per cent over production in 1931-32, showing a reversal in trend after several years of declining production, and the total production of 1,665,022 metric tons of nitrogen in 1932-33 was 76 per cent of production in the peak year 1929-30. Of particular interest however, is the fact that the production of various forms of synthetic nitrogen in 1932-33 was 1,299,149 metric tons, actually an increase over the production of 1,263,700 metric tons shown for 1929-30. This improved statistical position of synthetic nitrogen was of course attained partly at the expense of byproduct nitrogen, but largely at the expense of Chilean nitrogen. Whereas the production of byproduct nitrogen in 1932-33 was 295,073 metric tons, or 62 per cent of the 475,840 metric tons produced in the peak year 1929-30, it should be noted that the production of Chilean nitrogen in 1932-33 was 70,800 metric tons, or only 15 per cent of the 464,000 metric tons produced in 1929-30, and only 4 per cent of the production of all forms of nitrogen in 1932-33. Notwithstanding such drastic curtailment of production by Chile, it is estimated that excess stocks of Chilean nitrate are equivalent to at least two years' requirements based on present conditions.

The figures for world consumption show that for the first time in six years, that is, since 1926-27, the world consumption exceeded world production. This indicates the good effect of European nitrogen agreements as to controlled production. By the same token, should these agreements at any time fail to operate, then a reversion to chaotic conditions is to be expected.

As indicated by the accompanying Table II, the statistical position of the domestic industry was improved during 1933. It is estimated that the production of synthetic ammonia in 1933 was 150,000 short tons, equivalent to 123,000 short tons of nitrogen, an increase of 38 per cent over the previous year, and 86 per cent over 1931 production. Production of byproduct nitrogen also showed improvement over 1932, owing to increased activity in the steel industry and in public utilities operation. Furthermore, the apparent consumption of nitrogen was somewhat greater than in 1931, and about 33 per cent greater than in 1932. There has been no recent expansion of nitrogen plant, therefore domestic capacity for synthetic ammonia continues at approximately 300,000 short tons of nitrogen, a figure that is two and one half times the maximum output yet attained.

During the year there was some discussion of operating regularly the Muscle Shoals nitrogen plants, in connection with the TVA program. It is to be hoped that the ultimate decision will be to stay out of large-scale nitrogen production, since the fertilizer and other industry are providing adequate supplies of various forms of nitrogen at very low cost from existing private producers and by way of duty-free imports, and since, as stated previously, there is such enormous over-capacity which is not likely to be occupied for years to come.

Norway Exports

Norway had a much improved export business in nitrogen fertilizers during 1933. Preliminary figures indicate that exports of the major products were calcium nitrate, 360,000 metric tons, and sodium nitrate, 58,000 metric tons. The nitrogen equivalent of total exports, including cyanamide, nitric acid and ammonium nitrate, is estimated to have

Table I. World Production and Consumption of Nitrogen

(World figures for the fertilizer years indicated, ending June 30, in thousands of metric tons of contained nitrogen, as estimated by British Sulphate of Ammonia Federation)

	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33
Production:								
Ammonium sulphate								
Byproduct	297	328	368	376	425	360	302	267
Synthetic	289	300	367	485	442	349	522	574
	586	628	735	861	867	709	824	841
Cyanamide	150	180	198	192	264	201	134	172
Nitrate of Lime	30	81	105	136	131	110	79	111
Other forms:*								
Synthetic	121	184	242	383	427	393	348	442
Byproduct	48	50	54	51	51	31	30	28
Chilean Nitrate	399	200	390	490	464	250	170	71
Total Production	1,334	1,323	1,724	2,113	2,204	1,694	1,585	1,665
Consumption:								
Mfd. Nitrogen	935	1,091	1,249	1,453	1,587	1,377	1,417	1,624
Chilean Nitrate	324	275	393	419	364	244	138	129
Total Consumption	1,259	1,366	1,642	1,872	1,951	1,621	1,555	1,753
Agricultural consumption about	1,117	1,190	1,460	1,670	1,750	1,455	1,412	1,597

* Including nitrogen products used for industrial purposes (except Chilean nitrate) and ammonia in mixed fertilizers.

Note.—Fertilizers are included in these tables under the final form as sold, so that, for example, cyanamide if converted into ammonium sulphate is included under synthetic ammonium sulphate, or, if into ammophos, is included under other synthetic nitrogen.

Table Ia. Trends in World Production of Inorganic Nitrogen

Year	1903 Production, Metric Tons	Per Cent	1913 Production, Metric Tons	Per Cent	1923 Production, Metric Tons	Per Cent	1933 (Estimated) Production, Metric Tons	Per Cent
Synthetic Nitrogen All Forms	.....	...	30,000	4	420,000	42	1,290,000	76
Byproduct Nitrogen	129,000	37	290,000	41	270,000	27	340,000	20
Chilean Nitrate	220,000	63	400,000	55	310,000	31	70,000	4
World Total	349,000	100	720,000	100	1,000,000	100	1,700,000	100

been 69,200 metric tons, or 4 per cent of the world consumption for 1933.

One of the notable depression achievements is the marked expansion of sulphate of ammonia production in Japan. Sulphate is virtually the only nitrogen fertilizer used in Japan, and up to 1932 that country was a large consumer of imported sulphate. Recently, however, synthetic ammonia (and sulphate) production has increased with great rapidity, in fact more so than in any other major country. Sulphate production in 1930 was only 366,000 metric tons, as compared with 602,000 metric tons in 1931, 684,000 metric tons in 1932 and an estimated total of 850,000 metric tons in 1933. Present capacity is said to be 1,000,000 metric tons of sulphate, equivalent to 206,000 metric tons of nitrogen. Construction now in progress is expected to increase the total capacity much further, possibly to 250,000 metric tons of nitrogen, a figure which exceeds present or immediately prospective consumption. Therefore the outlook is for the entrance of Japan into world markets as an important exporter, thereby reversing the importing position held only a few years ago.

Superficially, the outlook for 1934 is encouraging, especially for the domestic industry, which has suffered particularly from the effects of imported sulphate of ammonia amounting to actual dumping in certain proved instances. The present position of the dollar in world exchange is favorable to an increase in domestic production of synthetic nitrogen products and to somewhat higher prices, although any further advance in prices doubtless will be moderate in order to encourage all reasonable consumption by agriculture and by industry. It should be pointed out, however, that prospects for continued improvement rest quite largely on several uncertain factors, that is, the position of the dollar in world exchange, and the cartelized stabilization of the European producers. If for example, should Holland go off gold, then a repetition of the 1932 crash in prices is to be expected. Therefore the nitrogen industry, here as elsewhere, is in an uncomfortable state of uncertainty.

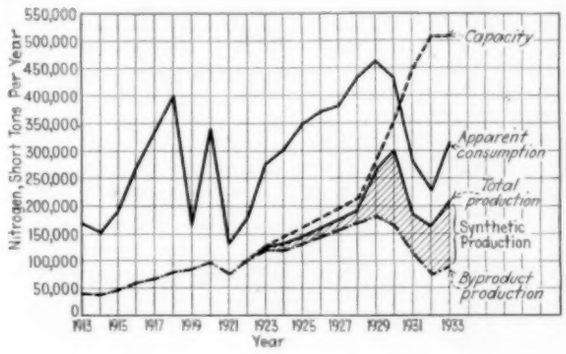
World consumption of inorganic nitrogen probably will continue to increase at a rate of 50 thousand metric tons per year, that is, the rate of increase which has held for the 25-year period from 1908 to 1933. Only in eight out of these 25 years has the world production of nitrogen deviated more than 5 per cent from this straight-line growth. In the next few years, the increase is likely to be somewhat greater, because of recovery from depressed consumption. It is interesting to note that after the post-war depression, nitrogen consumption was re-established on the straight line projected from 1908 to 1913.

Excess Capacity

This slow, but seemingly sure increased consumption of nitrogen indicates that the present excess capacity will remain for many years. Furthermore, earnings, if any, on capital in the nitrogen industry will be low, and only the larger companies will find any attraction in this form of investment.

International trade in nitrogen should become less, owing to the increased state of independence of supply being attained by small as well as large world powers. Near-term progress doubtless will be confined to improved processes, lowered costs, and the development of new products, especially fertilizers more nearly suited to intensive agriculture.

While agriculture theoretically should consume enormous quantities of nitrogen, the fact remains that the rich soils of our plains and elsewhere will sustain a nominal rate of production of grains for years to come without the aid of commercial fertilizer. Only on intensively cultivated areas is fertilizer actually a necessity, and the larger proportion of the 400 million acres of crop lands is not so cultivated. Therefore, the time when an enormous quantity must be used doubtless is much further in the future than has been indicated by propaganda put out during the past lamented "New Era."

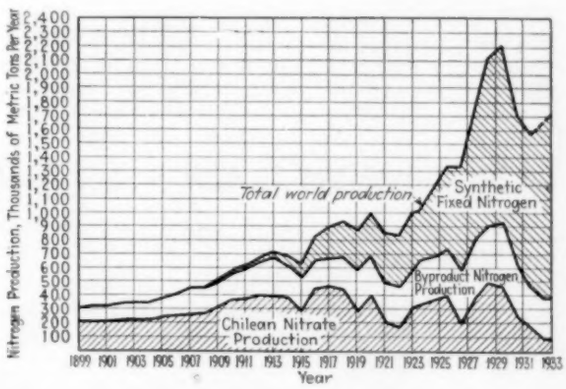


Inorganic Nitrogen Production Consumption and Capacity —U. S. A. Short Tons Nitrogen Per Year

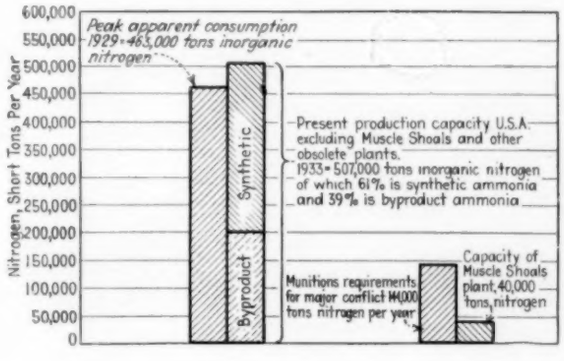
Table II. Inorganic Nitrogen Balance, U. S. A.

(Short tons nitrogen. Data are in part estimates and cover major items only)

	1933	1932	1931	1930	1929
Production, synthetic....	123,000	89,000	66,000	135,000	84,000
Production, by product..	93,000	77,300	115,000	164,300	182,300
Total production.....	216,000	166,300	181,000	299,300	266,300
Imports.....	110,000	99,000	143,600	155,400	243,000
Total supply.....	326,000	265,300	324,600	454,700	509,300
Exports.....	19,000	35,500	27,200	23,400	46,300
Apparent consumption	307,000	229,800	297,400	431,300	463,000



World Nitrogen Production (Metric Tons Nitrogen)


Nitrogen, Short Tons Per Year
Peak apparent consumption 1929=463,000 tons inorganic nitrogen
Synthetic
Byproduct
Present production capacity U.S.A. excluding Muscle Shoals and other obsolete plants.
1933=507,000 tons inorganic nitrogen of which 61% is synthetic ammonia and 39% is byproduct ammonia
Munitions requirements for major conflict 140,000 tons nitrogen per year
Capacity of Muscle Shoals plant, 40,000 tons, nitrogen

Comparison of Peak Apparent Consumption of Nitrogen With Present (1933) Production Capacity. Also War Requirements of Nitrogen Related to Capacity of Muscle Shoals Plant

GEOGRAPHICAL DISTRIBUTION OF NITROGEN CONSUMED

The figures in the following table are also to be taken as estimates only.
From annual report of
British Sulphate of Ammonia Federation, Limited

World Consumption of Pure Nitrogen
(In metric tons)

Continent	Fertilizer Year	Ammonium Sulphate and Ammonia for Mixed Fertilizers	Chile Sodium Nitrate	Calcium Cyanamide	Other Synthetic Nitrogen Fertilizers	Nitrogen Products for Industrial Purposes (excl. Chile nitrate)	Total
Europe	1926/27	386,384	118,075	155,812	189,288	59,770	909,329
	1927/28	409,474	176,225	163,414	219,077	61,446	1,029,636
	1928/29	416,860	201,010	173,370	274,790	85,630	1,151,660
	1929/30	429,101	187,357	168,465	300,801	84,852	1,170,576
	1930/31	369,459	141,000	138,396	278,191	67,426	994,472
	1931/32	441,363	90,544	121,544	290,147	71,043	1,014,641
	1932/33	431,687	71,537	135,608	343,981	70,745	1,053,558
Africa	1926/27	7,847	28,115	180	5,141	50	41,333
	1927/28	8,653	33,255	566	6,597	100	49,171
	1928/29	9,330	32,030	330	9,070	270	51,030
	1929/30	10,460	36,176	680	13,057	275	60,648
	1930/31	8,727	30,400	654	13,085	505	53,371
	1931/32	10,947	23,407	120	22,506	4,188	61,168
	1932/33	16,085	9,170	194	28,840	6,214	60,503
Asia	1926/27	136,486	9,263	7,309	302	2,500	155,860
	1927/28	161,723	13,090	19,708	2,374	4,600	201,495
	1928/29	196,140	16,860	19,380	7,110	5,680	245,170
	1929/30	217,381	9,504	22,770	15,480	5,074	270,209
	1930/31	200,219	5,900	28,467	8,652	6,002	249,240
	1931/32	211,639	3,258	12,450	11,698	10,164	249,209
	1932/33	269,260	3,159	31,590	18,668	13,897	336,574
Oceania (including Hawaii)	1926/27	7,156	9,269	....	482	400	17,307
	1927/28	7,390	9,340	....	1,001	400	18,131
	1928/29	9,730	10,400	....	950	400	21,480
	1929/30	14,934	13,222	20	2,108	1,100	31,384
	1930/31	15,149	6,000	6	3,345	934	25,434
	1931/32	14,719	4,852	....	4,291	850	24,712
	1932/33	17,815	595	....	4,181	1,250	23,841
America	1926/27	53,399	110,436	16,108	12,660	49,903	242,506
	1927/28	84,992	160,812	18,680	24,324	55,150	343,958
	1928/29	95,600	159,150	24,400	58,290	65,300	402,740
	1929/30	139,880	117,634	26,000	68,799	65,667	417,980
	1930/31	129,400	61,000	13,765	39,978	54,645	298,788
	1931/32	113,458	16,147	10,554	14,480	50,965	205,604
	1932/33	140,279	44,793	10,622	22,733	60,560	278,987
World	1926/27	591,272	275,158	179,409	207,873	112,623	1,366,335
	1927/28	672,232	392,722	202,368	253,373	121,696	1,642,391
	1928/29	727,660	419,450	217,480	350,210	157,280	1,872,080
	1929/30	811,756	363,893	217,935	400,245	156,968	1,950,797
	1930/31	722,954	244,300	181,288	343,251	129,512	1,621,305
	1931/32	792,126	138,208	144,668	343,122	137,210	1,555,334
	1932/33	875,126	129,254	178,014	418,403	152,666	1,753,463

WORLD EXPORT TRADE IN SULPHATE OF AMMONIA

The following table shows the excess of exports over imports of sulphate of ammonia during the last twelve calendar years, expressed in metric tons of nitrogen, for all countries having a surplus in any year:

Balance of Exports of Ammonium Sulphate
(In metric tons of nitrogen calculated at 20.6 per cent)

Calendar Year	Balance of Exports from: Great Britain and Ireland	United States[a]	Germany	Other European Countries[b]	British Empire Countries[c]	Total
1920	22,832	12,050	5,346	197	6,759	47,184
1921	26,163	20,498	2,385*	473	5,323	54,842
1922	29,862	29,804	2,443	1,532	3,930	67,571
1923	51,588	31,423	24,489	4,810	4,835	117,145
1924	54,764	23,518	21,323**	2,904	5,290	107,799
1925	51,736	20,800	100,903**	2,201	4,728	180,368
1926	30,252	34,680	138,057**	3,233	3,647	209,869
1927	52,405	25,438	137,770**	1,918	4,371	221,902
1928	78,824	10,663	172,426**	5,591	2,292	269,796
1929	120,381	26,310	149,680**	13,666	4,255	314,292
1930	111,757	10,021	86,298**	36,814	1,605	246,495
1931	78,281	.....	125,878**	51,010	....	255,169
1932	81,062	.....	77,238	98,671	5,136	262,107

*May to December only.
**Including reparations deliveries.
[a]Not including exports from U.S.A. but including imports from other countries to the non-contiguous territories of Alaska, Hawaii and Porto Rico.
[b]Poland, Belgium, Holland, Czechoslovakia, Italy, Sweden, Norway, Austria, Hungary and Roumania.
[c]Canada, Australia, India, S. Africa and New Zealand.

Dye Imports Increase In Volume

THE invoice value of dyes imported into the United States during 1933 increased 36 per cent compared with 1932, according to C. C. Concannon, Chief of the Chemical Division of the Bureau of Foreign and Domestic Commerce. Imports in 1933, entered for consumption, totaled 4,288,214 pounds valued at $4,791,704 against 3,904,628 pounds invoiced at $3,516,968 in 1932.

Dye imports in the past year not only increased in poundage and value but there was seemingly a trend toward purchases of the higher-priced specialties of foreign origin. The increased 1933 invoiced unit value—$1.11 a pound in 1933 compared with the 1932 unit price of $0.91—may have been caused by foreign currency appreciation, it was stated.

Imported dyes in 1933 accounted for one-fifth by value of United States consumption, according to estimates by Mr. Concannon. It is believed that when complete data are at hand, the 1933 ratio will be above the average of recent years. Mr. Concannon stated that the preliminary 1933 ratio was calculated by comparing the approximate duty paid value of imported dyes entering into domestic consuming channels with the estimated value of 1933 consumption.

American production undoubtedly increased in 1933 if consumer activity may be taken as a guide. Predicating estimates upon a domestic sales figure 25 per cent above that of 1932 the ratio of imports (duty-paid value) to apparent domestic consumption is 17.5 per cent. If an allowance is made for profit and overhead (estimated by the Tariff Commission at 15 per cent) imports were equivalent to 20 per cent of domestic dye sales consumption.

Incoming shipments entered the United States consuming channels chiefly through the port of New York, smaller amounts being entered through Boston, Albany, Newark and Philadelphia. Imports, entered for consumption, through the port of New York in 1933 total 4,220,827 pounds valued at $4,738,422; Boston, 60,386 pounds valued at $48,427; Albany, 3,819 pounds valued at $1,718; Newark, 1,968 pounds valued at $2,895; Philadelphia, 1,214 pounds valued at $243.

In 1933, Germany supplied approximately three-fifths and Switzerland nearly two-fifths of our incoming shipments. Around 2 per cent of foreign dye shipments originated in England and relatively very small quantities in France and the Netherlands. Germany's share in 1933 dropped to 59.66 per cent from 68.27 per cent in 1932.

Codes and T.V.A. Influence Fertilizer Trends

By R. S. McBRIDE
Editorial Representative
Chem. & Met.

FERTILIZER MAKERS marketed in the United States last year about 4.6 million tons of all classes of goods combined. This tonnage should be equalled or slightly increased during the present year; but the most optimistic estimates which seem well founded do not forecast more than a 10 per cent increase in sales during 1934. In considering these figures, of course, one must compare them with peak sales in excess of 8 million tons a few years ago.

Will A.A.A. Benefit Fertilizers?

Agricultural conditions as determined by Federal plans, principally those under A.A.A., are of outstanding importance to this industry. The crop curtailment program of the Government affects cotton, corn, tobacco, wheat; four of five crops which use more fertilizer than any others. The curtailment of acreage will, therefore, tend to reduce the prospective market to like extent. But the secondary effect of the program, giving cash income to these farmers, is expected to have a compensating, or even greater, beneficial influence on fertilizer buying. Hence the forecast of slightly increased sales this year.

Code development for the industry has resulted in a set of marketing agreements more sweeping than any previously considered, even under Federal Trade Commission auspices. Furthermore, it is expected that these marketing requirements will be enforceable on a vast majority of the industry. Hence a more stable price structure is hoped for and greater opportunity for profit is forecast, even at the low expected rate of operation. A secondary effect of this, one extremely important to the chemicals makers, is a prospect that prices of fertilizer chemicals also can be maintained on an even level.

In a large number of cases the basis of price quotation for fertilizers has been changed to a price delivered at the farm. This gives an apparent higher level of prices, compared with the old f.o.b. plant quotations; but this is not found to be a fact in prices actually paid by the farmer. As a matter of fact, prices are little different now, under the open-price agreements required by the code, than in the immediately preceding period. But the maintenance of these prices to the farmer, or a frank open statement of changes in price, becomes an absolute requirement on each company.

Small Profit Now Possible

Apparently some of the leading concerns of the industry have decided that under this code program it is now possible to base prices on factory cost, plus 10 per cent mark-up, plus freight and delivery charges. If this 10 per cent margin is maintained, a small return on plant investment may actually result.

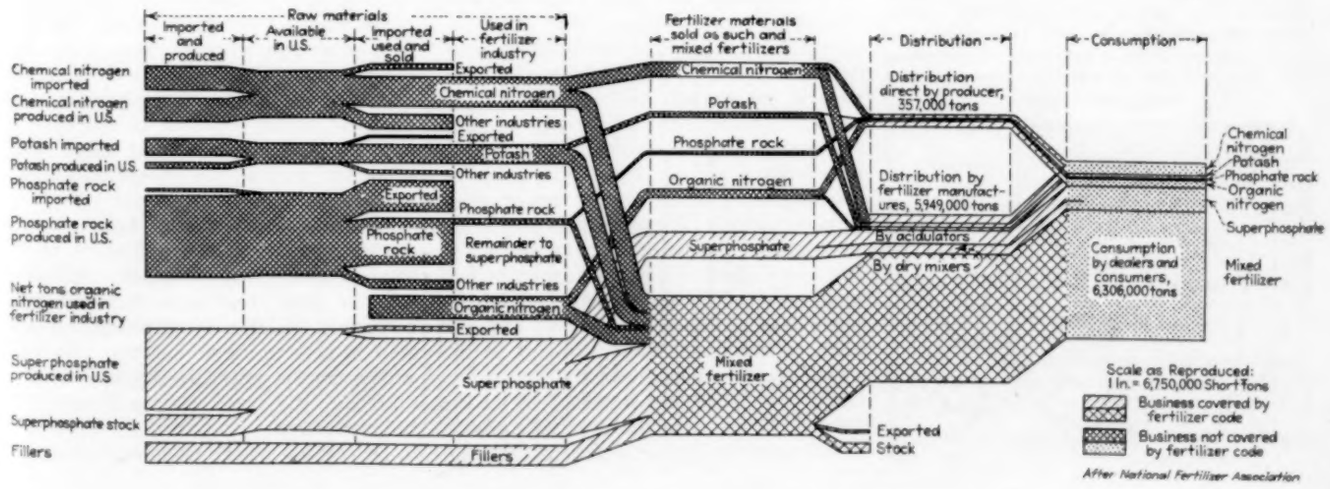
The largest cloud above the industry's horizon appears to be the controversy relating to marketing practice in the case of certain important fertilizer chemicals. Concerns selling some of these materials, in order to avoid operating under the code, are seeking to have their former dealer customers change from mere dealers to dry-mixers. Such change creates new manufacturing capacity for which there is no economic need or justification. It is also jeopardizing to some extent cordial relations with the farmer cooperative-purchasing corporations, which, of course, work outside the code. More aggressive leaders of the industry believe that this initial movement will be found unprofitable by the chemical purveyors who practice it, and will have to be abandoned. Obviously they hope so. In the meantime, business friendships are being strained rather severely at some points.

T.V.A. Plans Affect Industry

Operations of Tennessee Valley Authority, prospective manufacturer of fertilizer on a large scale, are also of great importance to the industry. One fertilizer executive, referring to this situation, said: "We hope that T.V.A. will treat us as well as it has some of the small power companies, and buy us out." In this, reference was made to the announcement on January 5 of the purchase by T.V.A. of transmission and small distributing systems. A like development with reference to fertilizer might afford, so the leader above quoted implies, a chance for virtually bankrupt small fertilizer companies in the Valley to escape from enterprises for which the financial future is, to say the least, unattractive.

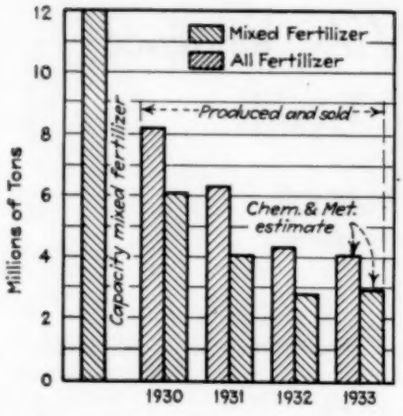
There is no evidence that T.V.A.

Flow chart showing for the year 1931 importation and production of fertilizer materials and their distribution and use, direct and in mixed fertilizers (National Fertilizer Assn.)

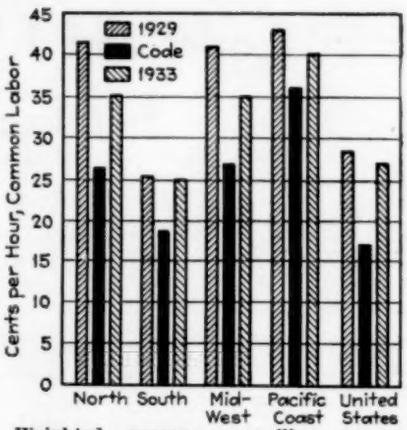


wishes to put itself in the fertilizer business to that extent. Its further development is much more likely to be through participation in the activities of the farm-cooperative fertilizer corporations. The relation between commercial fertilizer makers and these cooperatives is, therefore, being carefully nurtured by the wiser leaders of the industry, with a view to giving every practical aid to the cooperative movement as a friendly contemporary, rather than as a critical competitor of the fertilizer industry.

Simplification of trade practice may prove one of the most beneficial parts of code development. Far too many grades and brands of fertilizer have been marketed. Already conferences of state and zone groups within the industry are attacking this problem. Virginia, North Carolina, South Carolina, Mississippi, Louisiana, Oklahoma, and Texas are all definitely embarking on these programs. When they have been agreed to under the procedure provided by the code, they become virtually compulsory limitations on all doing business in the regions affected. The results are expected to occasion lower plant cost, much lower warehousing and transportation cost, perhaps even lower delivered prices.



Fertilizer capacity and production in the United States, 1930-1933 (National Fertilizer Assn.)



Weighted average prevailing wage rates for common labor in fertilizer industry (National Fertilizer Assn.)

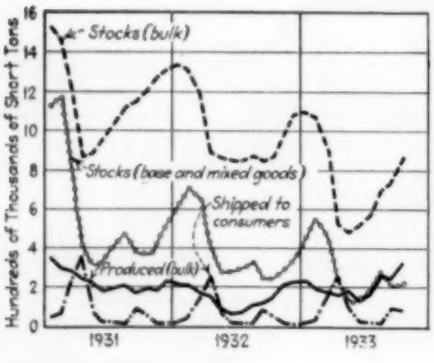
World Nitrogen Situation

Chilean nitrate supplied only 7 per cent of the world's consumption of nitrogen last year. Synthetic nitrogen products accounted for 76 per cent, with 17 per cent from byproduct sources. During the last fertilizer year, consumption was greater than in either of the two years preceding, but still about 10 per cent below the peak consumption of 1929-1930. Synthetic production, however, was greater than in any preceding year and Chilean nitrate production fell to an all-time low for this century, and longer.

Consumption slightly exceeded production in the case of both manufactured and natural nitrogen products. Especially was this result favorable to the banker holders of notes on which nitrate had been collateral. Apparently, the United States stocks of nitrate are now on a fair working basis, more than 300,000 tons out of the 400,000 or more in stock a year ago having been consumed during this period, with imports for the year amounting to only approximately 100,000 tons.

The United States was, during the year, a large importer of ammonium sulphate. This was largely because of the curtailed activity of the byproduct coke plants, an inevitable result of reduced operations in both blast-furnace and steel divisions of the industry. It is significant that the imports last year were, in nitrogen content, five times as much in ammonium sulphate as in Chilean nitrate. Resumption of metallurgical activity in the United States will presumably curtail somewhat the net imports of ammonium sulphate. And the depletion of domestic stocks of Chilean nitrate may simultaneously occasion renewed import activity; but some further transfer of business from nitrate to ammonium sulphate may occur because of continued favorable price relations.

Superphosphate production in 1933 exceeded by 50 per cent that of the preceding year, but fell 10 or 15 per cent below 1931. Sales exceeded production so that final stocks are slightly below those a year ago. Production for 1934 is expected slightly to exceed that of the past year.



Sulphuric Acid Comes Back During 1933

EDITORIAL STAFF

ONCE AGAIN the grandfather of business indicators has pointed the trend, this time, however, with somewhat more emphasis than was warranted by the general condition of business. Why this should have been the case is not entirely clear, although it is evident that both the sticking power and the recuperative ability of the chemical industries have been better during the depression than in the run of business activity. There is also an additional fact to account for it, namely, the improved condition of the farmer which was reflected in an increase in superphosphate production of over 50 per cent. Other large improvements in the metallurgical industries and in rayon had a comparatively small effect on the total and hence can be credited only in small part with the 17.6 per cent advance that sulphuric acid made during the year. The increase was not spectacular and production is still slightly more than 12 per cent below 1931, but in comparison with the bare 6 per cent rise in general activity, it is a record of which the chemical industry may indeed be proud. There is evidence to indicate that chemical and allied products may well be the Moses to lead the world out of the wilderness.

As in earlier January issues, *Chem. & Met.* has prepared estimates of the total production of sulphuric acid during the year just past, together with estimates of the distribution of this acid in consuming industries. As 1933 was a census year, the figures must be taken for the frank estimates that they are, tentatively presented and presently to be revised where revision is possible.

The total, 5,168,000 short tons of acid, expressed as 50 deg. Bé., compares with 4,410,000 tons in 1932 and 5,904,000 tons in 1931. There have been many better years, but few of more hopeful import. Use by the largest consumer, fertilizers, clearly reflects the subsidized condition of the farmer, being nearly 54 per cent better than in 1932. The 1,200,000 tons of acid consumed during the year in this industry is only about 17 per cent below 1931 and 50 per cent below the peak year of 1930. Petroleum refining reflects a decrease of some 7 per cent, but this is a result of changes in refining practice rather than in run to stills. Actually, petroleum production was larger but two trends cooperated to reduce the acid consumption below that of 1932. One was the increasing stress that has been laid on high anti-knock rating, which is not compatible with heavy acid treatment; the other the continued tendency in some parts of the country to offer under-refined products at bargain prices.

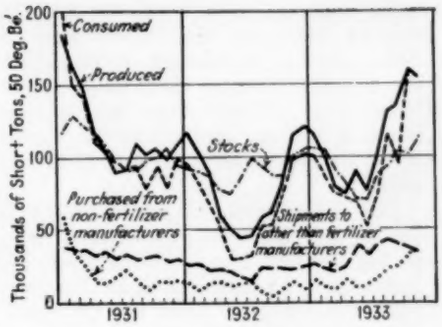
The improvement in consumption for chemicals was 7.6 per cent, contrasting with a 24.8 per cent increase in the acid going to coal byproducts. As this was chiefly represented by sulphate of ammonia, the influence of the farmer was again evident. In the case of iron and steel, the 44 per cent rise, far below the increase in ingot production, shows a considerable improvement in the heavy end of the business, without an equal advance in stamping stock, galvanized iron and tin plate. Automobile production, much improved though it was, was far below the earlier levels. Consumption in other metallurgical lines showed average improvement, with none of the spectacular quality encountered in those fields dominated by some single large industry.

As would be expected, the advance in paints and pigments, amounting to 6.3 per cent, had necessarily to wait on general business. Explosives showed an average improvement of 16.7 per cent, and textiles a rather more marked advance of 20 per cent. Far more notable than the improvement in the older fibers was that in rayon, with which we have combined transparent wrapping film. Here an increase of 37.5 per cent, somewhat larger in rayon than in film, points to the largest year by far that either of these synthetic products has ever enjoyed.

An accompanying chart shows the trends in acid consumption in each of the fields here enumerated, from the comparatively normal year of 1928 until the present. Most of these curves indicate about what would be expected in a period such as that past. Two of them, however, those for rayon and film, and for petroleum refining, show trends that quite evidently are influenced in only a minor way by the business cycle, namely, that in the case of rayon, no end to its expansion is yet in sight, while the tendency in petroleum is evidently toward continued decrease in acid requirements.

No very notable differences in the sources of this acid are to be found, although one authority has noted that much lower pyrites prices, particularly in the middle west, have strengthened the use of this material. With no new acid construction of any kind since 1931 (except the Hechenbleikner process sludge-acid-recovery plant at Petrolia, Pa.) the abandonment of some of the smaller chamber plants has again raised the percentage of contact acid to a figure that is probably in the neighborhood of 48 per cent of the total, comparing with 43 per cent in 1932. Estimates place the acid produced from brimstone at 2,998,000 short tons on a 50 deg. Bé. basis, not including that made with supplementary brimstone in zinc byproduct plants. Pending the issuance of the Census and Bureau of Mines figures for byproduct production in copper and zinc smelters, which supply the only reliable indices of acid activity in such plants, we have estimated that total byproduct acid made during the year was in the neighborhood of 1,020,000 tons. The output from domestic pyrites is believed to have been about 290,000 tons, exclusive of that from concentrates burned in metallurgical plants; and from imported pyrites, about 860,000 tons, all as 50 deg. Bé.

The most reliable estimate of domestic sulphur shipments yet available for 1933 places the figure at 1,450,000 long tons in comparison with 1,108,112 long tons in 1932 and 1,376,526 long tons in 1931. Sulphur production, estimated at 1,375,000 long tons, represented an advance of nearly 55 per cent over the 889,695 tons of the preceding year which, of course, was an abnormally low one due to the determination of producers to depend largely on stocks in protest against the heavy production taxes imposed by Texas. Exports are esti-

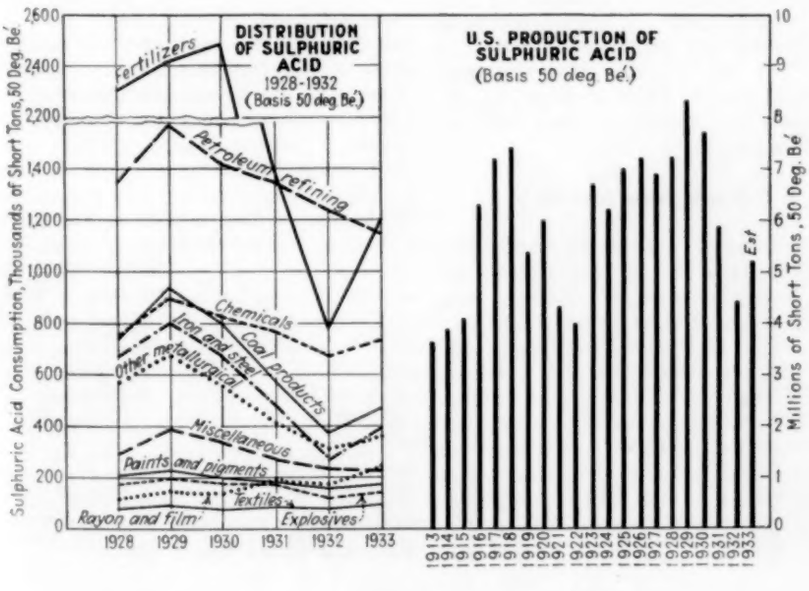


Sulphuric acid in fertilizer plants, 1931-33 (U. S. Bureau of Census)

Estimated Distribution of Sulphuric Acid Consumed In the United States

(Basis, 50 deg. Bé.)

Consuming Industries	1931 Short Tons (Revised)	1932 Short Tons (Revised)	1933 Short Tons
Fertilizer	1,455,000	780,000	1,200,000
Petroleum refining	1,348,000	1,240,000	1,150,000
Chemicals	760,000	674,000	725,000
Coal products	570,000	375,000	468,000
Iron and steel	480,000	270,000	390,000
Other metallurgical	410,000	310,000	360,000
Paints and pigments	180,000	160,000	170,000
Explosives	175,000	120,000	140,000
Rayon and cellulose film	183,000	176,000	242,000
Textiles	81,000	75,000	90,000
Miscellaneous	262,000	230,000	233,000
Totals	5,904,000	4,410,000	5,168,000



mated at 500,000 long tons, a very material increase over both the 407,586 tons of 1931 and the 351,509 tons of 1932. Stocks apparently decreased to about 2,456,000 long tons, much below either the 3,031,000 tons held at the mines at the end of 1932 or the record stocks of 3,250,000 tons on Dec. 31, 1931.

Just what sulphur production came out of the new workings in Louisiana during the year is not definitely known. Going into operation late in October, 1932, the Jefferson Lake Oil Co., mining the under-water Lake Peigneur dome, brought 13,401 long tons to the surface in 1932. During the first seven months of the year the rate of operation was such that the total for 1933 was probably in the neighborhood of 300,000 long tons. In addition to the mines of this company, those of the Freeport Sulphur Co., which had rushed the completion of its new plant at Lake Grande Ecaille, La., went into action on December 8, 1933, with a production of about 6,725 long tons before the turn of the year. Outside of Louisiana, the two principal Texas producers continued at a reduced rate, with the third still in operation, although accounting for an increasingly smaller quantity, according to reports.

World Output Remains Low

Outside the United States, sulphur production continued to be small by comparison. Probably 390,000-400,000 tons of natural sulphur was extracted in Italy, Sicily, Japan, Chile and Spain. Added to this is a possible 60,000 tons of sulphur recovered from pyrites in Norway and 15,000 tons of byproduct sulphur in Germany and Spain. Not including our own byproduct production from gas purification, it appears that the United States still accounts for 75 per cent of the world's supply.

Pyrites imports during the year are believed to have been slightly in excess of 330,000 long tons, all of which except a small increase in stocks at acid plants went to acid production. This import compares with 253,248 tons in 1932 and 352,066 tons in 1931. Domestic pyrites production is estimated at 220,000 long tons, including pyrrhotite and concentrates used at metallurgical plants, comparing with 184,989 tons in 1932 and 330,848 tons in 1931.

Technical developments in acid production during the year were almost totally lacking. As reported in our December issue, experimental work has been continued by the Chemical Construction Co. with its Hechenbleikner sludge conversion process. Leonard Construction Co. is reported to have simplified the purification equipment for metallurgical and other byproduct gases and to have designed much larger units than was previously thought possible. This has come about through the use of welded-steel rather than cast-iron converters. In one quarter it is reported that the trend seems to be toward the use of byproducts of all kinds, including metallurgical, coke-oven and refinery gases, refinery sludges and metallurgical concentrates. Although little if any progress has been made recently with flash roasting, some commentators expect this method of burning pyrites and concentrates to become increasingly important.

Year's Alkali Developments Show Optimism Warranted

EDITORIAL STAFF

WHAT HAD APPEARED in 1932 to be a large measure of overcapacity in the alkali industry was found not only to be warranted in 1933, but to justify also what capacity was added during the latter year. This should not be taken to mean that all of the new capacity contemplated for immediate construction on the Gulf Coast is either necessary or desirable, but it does mean that the useful, modern capacity in plants now operating is not too large for the needs of a country wherein the per capita consumption of soda products is at least twice that anywhere else in the world. Even with the increasing economic nationalism that has been apparent, in alkalis as in other commodities, somewhere in the neighborhood of 2,247,000 tons of soda ash was produced and consumed in one form or another, in comparison with a plant capacity total of about 3,180,000 tons (including natural soda) existing at the end of 1933. During the last year for which census figures are available, 1931, the production was 2,189,351 tons, while the revised estimate for 1932 is 1,952,000 tons. In comparison with 1929, soda ash production was down some 8.5 per cent but that the trend seems to have reversed is clear from the increases of 2.8 per cent over 1931 and 15.1 per cent over 1932.

Caustic Soda Also Up

The increase over 1932 corresponds very closely to the advance in soda ash sales which is estimated to have been 14.8 per cent. The decrease in sales from 1929 was somewhat larger, 16.9 per cent, but here again the trend has clearly changed. Caustic soda production has likewise turned the corner with a total of about 690,000 tons (lime-soda plus electrolytic) in comparison with 658,889 tons in the last census year, 1931, and 595,000 tons in 1932.

As is evident from our annual estimates of the distribution of soda ash sales, exports, which increased slightly, nevertheless led the list in percentage increase over 1932, with a rise of 93 per cent. Despite this, with Japan probably lost from the export market because of the completion of its own soda plant program, exports cannot be counted on to rise to a large figure unless the South American market, now dominated by England, can be captured. Glass manufacture, still the largest soda-ash consumer, used 29 per cent more than in 1932. The activity in the container field was not as great as had been anticipated and a larger increase in the total for glass will have to await the return of building construction. Textiles followed, with an increase of 26 per cent, for textiles enjoyed an excellent year in comparison with what the last decade has led the industry to expect.

Peak Tonnage for Chemicals

Pulp and paper consumption was up 18.2 per cent and chemicals, 10.8. The showing in the latter was in part dependent on the continued increase in sodium nitrate synthesis at Hopewell, Va. The chemicals classification has thus become second in size only to glass.

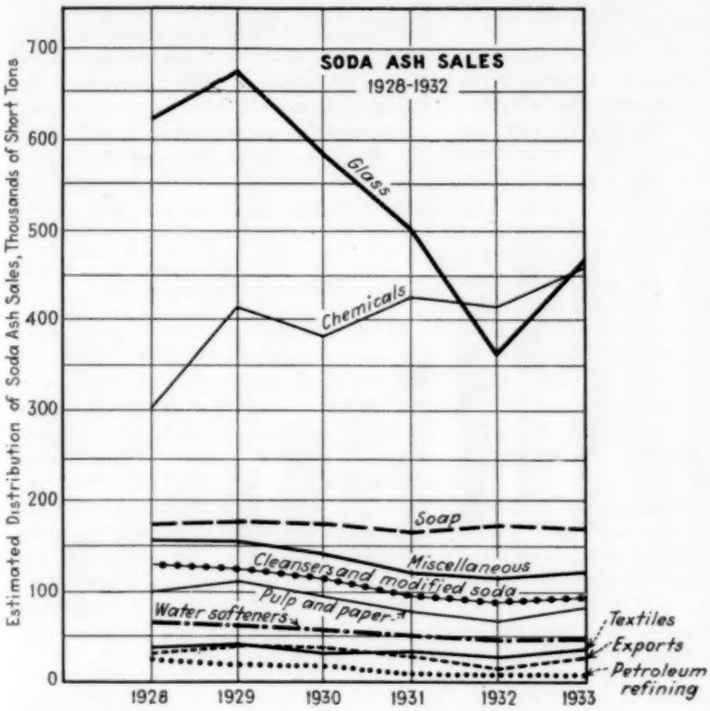
Next in the order of increase over

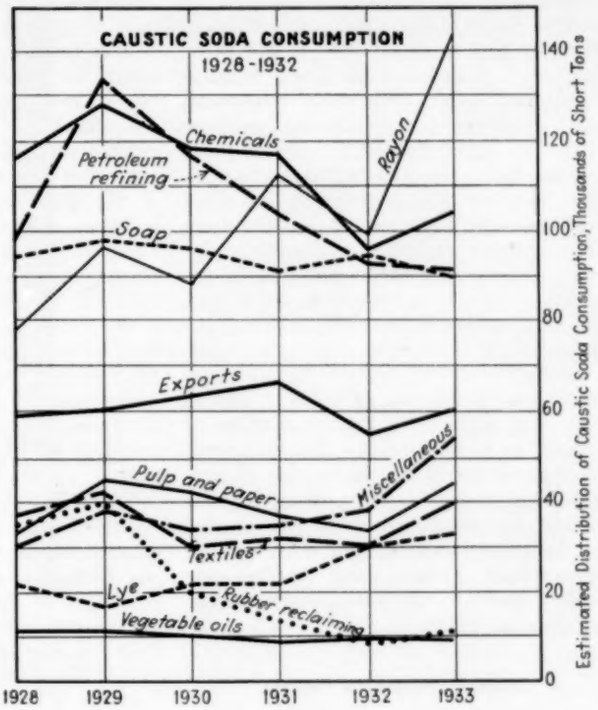
Production of Caustic Soda in the United States

(Short Tons)

Year*	Lime-Soda	Electrolytic	Total
1921	163,044	75,547	238,591
1923	314,195	122,424	436,619
1925	355,783	141,478	497,261
1927	387,235	186,182	573,417
1929	524,985	236,807	761,792
1931	455,832	203,057	658,889
1932 (revised)	415,000	180,000	595,000
1933 (estimated)	490,000	200,000	690,000

*Figures for 1921-31 are from the U. S. Bureau of the Census. Electrolytic caustic soda figures do not include that made and consumed at wood-pulp mills, estimated at about 30,000 tons in 1927 and 1929, at about 24,000 tons in 1931, 20,000 tons in 1932 and 21,000 tons in 1933.





Estimated Distribution of Soda Ash Sales in the United States

Consuming Industries	1931 Short Tons (Revised)	1932 Short Tons (Revised)	1933 Short Tons
Glass	502,000	362,000	467,000
Soap	166,000	173,000	170,000
Chemicals	424,000	415,000	460,000
Cleansers and modified sodas	94,000	88,000	94,000
Pulp and paper	78,000	66,000	80,000
Water softeners	50,000	45,000	47,000
Petroleum refining	9,000	8,000	8,000
Textiles	31,000	27,000	34,000
Exports	28,000	13,000	25,000
Miscellaneous	120,000	115,000	121,000
Totals	1,502,000	1,312,000	1,506,000

Estimated Distribution of Caustic Soda in the United States

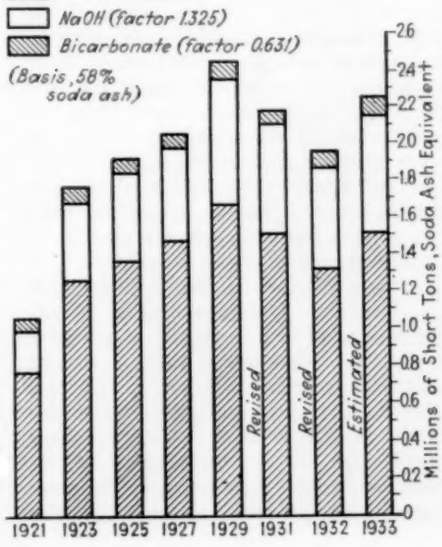
Consuming Industries	1931 Short Tons (Revised)	1932 Short Tons (Revised)	1933 Short Tons
Soap	91,000	95,000	90,000
Chemicals	117,000	96,000	104,000
Petroleum refining	104,000	93,000	91,000
Rayon	108,000	99,000	144,000
Lye	22,000	30,000	33,000
Textiles	32,000	30,000	40,000
Rubber reclaiming	14,000	8,000	11,000
Vegetable oils	8,500	9,000	9,000
Pulp and paper	36,500	34,000	44,000
Exports	66,000	55,000	60,000
Miscellaneous	35,000	38,000	54,000
Totals	634,000	587,000	680,000

1932 were the cleansers and modified sodas, up 6.8 per cent. Miscellaneous uses advanced 5.2 per cent and water softeners, 4.5 per cent. No change was found in petroleum refining, while there was a small decrease of 1.7 per cent in the soda ash going into the manufacture of soap. This was occasioned by unexpectedly bad business in the soap industry during the last quarter of the year.

A number of large advances are to be noted in the distribution of caustic soda consumption. The total consumption was 15.8 per cent higher than in 1932 and only 5.5 per cent below the peak year of 1929. The largest increase, both absolute and in percentage, was in rayon where a phenomenal year has projected the synthetic fibers into undisputed first place as a consumer of caustic. The 45.5 per cent increase here, which does not include the caustic going to a largely increased output of transparent wrapping film, is only approached by the much smaller absolute increase in miscellaneous uses, which rose 42.2 per cent. Rubber reclaiming, which has been relatively inactive since 1929, advanced 37.5 per cent, textiles 33.3, and pulp and paper 29.5 per cent. Lye accounted for an additional 10 per cent, exports for 9.1 and chemicals for 8.3 per cent increase. There was no change in vegetable oils, and small decreases of 2.1 and 5.3 per cent were found to have taken place in the consumption of caustic for petroleum refining and soap, respectively.

The United States is unique in alkali manufacture in that it is the only country where some one factor does not dominate. Although it has been 22 years since a new ammonia soda producer has entered the field, the balance of technical development has remained fairly evenly distributed. True, there are large differences in size between the various producers, with the largest

Production for sale of principal ammonia-soda products in the United States



having 43.6 per cent of the present capacity, the next two 19.7 per cent each, down to the smallest with 5.5 per cent; but every plant has maintained its technical excellence, and more important, each producer has continued to show a profit. This despite the era of price cutting that was initiated in 1930. The year's technical improvements have not been notable, carrying on in the main developments that were already under way. There was some increase in capacity, further substitution of rotary for reciprocating blowers, and the installation of better gas-control systems.

Certain of the companies have experimented with the use of natural gas as fuel, and some with the production of cement as a byproduct. Two concerns have gone into the manufacture of carbon-dioxide ice. One, using a new method for producing H_2S, has entered on the production of byproduct sodium thiosulphate. Others have installed new boiler plants, and one a new brine-purification plant.

Southern Plants in Process

Much more important than any of the improvements in existing plants are the plans that have been laid in recent years for the development of the ammonia-soda possibilities of the Gulf Coast. One attraction of the South is the existence of an increasing demand which at present can be met only at freight costs equal to or greater than the actual cost of the soda. Of the existing plants, one has canal transportation, three have lake transportation and two are inland. In addition to salt, ample limestone supplies and cheap natural gas, the Gulf Coast offers unexcelled transportation, both by coastal steamer and through the Mississippi Basin inland waterway. It is such considerations as these that have caused three producers, Solvay Process Co., Mathieson Alkali Works and a combine of Pittsburgh Plate Glass (Columbia Alkali) and the American Cyanamid Corp., which have jointly formed the Southern Alkali Corp., to project Gulf Coast plants. It is estimated that the three new plants together will have a total capacity in excess of 350,000 tons of ash per year.

What plans Solvay Process Co. has are not definitely known, although it is rumored that both the Baton Rouge and the Houston regions are under consideration. It is reported that this concern has employed draftsmen and that plans are nearing completion. With glass plants moving into the Houston district, it is said that a 35,000 ton annual demand will shortly exist there. Solvay is reported to have the intention of installing sufficient capacity to take care of the Hopewell requirements, together with local demand. Syracuse, it is conjectured, will in considerable part be held in reserve.

Mathieson Alkali Works' southern plant, for which ground has been broken, is being erected at Lake Charles, La., in Calcasieu Parish, where the company owns 1,660 acres. It has salt rights on 350 acres in Cameron Parish, in the Hackberry oil field. It has also acquired right-of-way for a 20-mile pipe line which will convey the brine to the plant. The cost of the project is estimated at $7,500,000 of which $2,182,000 is to go to the ash plant, $870,000 to the caustic plant and $777,000 to the lime plant. From this location, shipments may be made both for export and to coastal points, as well as by barge through the Mississippi Basin waterway.

The third plant, that of the Southern Alkali Corp., which has been under construction for several months at Corpus Christi, Tex., is to involve an expenditure of about $7,000,000. The corporation has 400 acres at Avery Point, west of Corpus Christi, accessible to deep water and to the natural gas fields, 6,000 acres of which are reported under lease. Salt brine will be brought in by means of a 12-in. pipe line from the Palangana salt dome, 60 miles away. Two subsidiary corporations will serve the main organization, one producing the stone and the other handling the transportation of stone and the operation of the brine line.

Pritchard Process in Use

Developments in caustic soda have not been numerous. Three plants are now using the patented Pritchard process whereby sodium sulphate is added to the cell liquor in electrolytic plants to throw down a complex triple salt of NaCl, Na_2SO_4 and NaOH, thus removing a considerable part of the salt that made electrolytic caustic unusable for certain purposes. An increasing use of nickel is to be noted, together with a further spread of the forced-circulation nickel evaporator for the high concentration of caustic liquors.

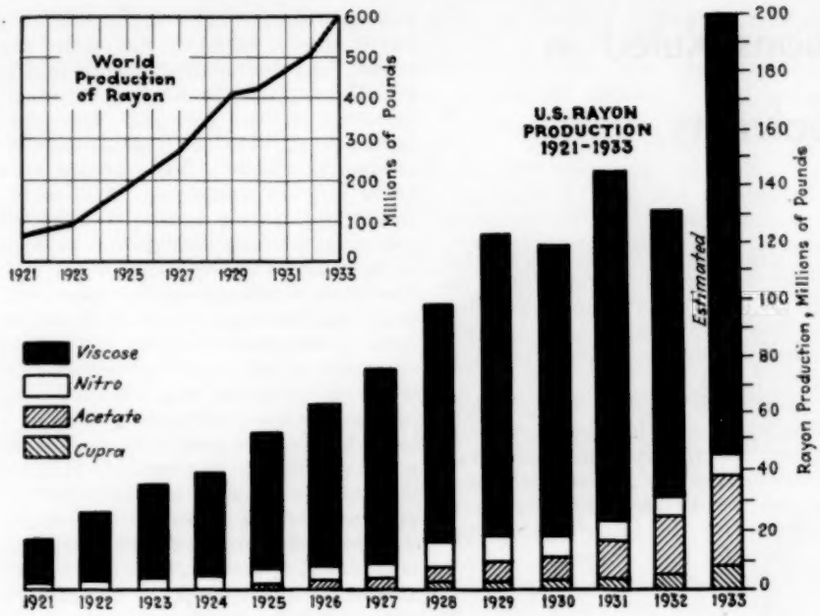
No Limit in Sight for Rising Rayon Production

EDITORIAL STAFF

IT HAS CEASED to be a novelty for rayon to surpass all previous records, for with the exception of the years, 1930 and 1932, every summing-up period has shown the same story: production has gone far beyond all previous years, with the end not yet in sight. Consumption of the synthetic fibers passed silk in 1926. The margin by which wool has surpassed it has been steadily decreasing and the two may meet within a few years. Only cotton is safe from the attack and even in this case, rayon is approaching the comparatively dizzy eminence of 6.5 per cent of cotton consumption.

Final figures that will shortly be published by the *Textile Organon*, based on reports from the greater part of the industry, are not yet available. The total for the United States, 208,000,000 lb., forecast in September by *Textile World*, now seems slightly too high in view of a decreasing rate of activity toward the end of the year. However, this decrease was not great and an estimate of 200,000,000 lb. will probably not be far out of line. Indications are that the industry operated, on the average, at 86 per cent of its capacity as given in July by *Textile Organon*, and that the distribution among processes was about as follows: viscose, 154,700,000 lb.; acetate, 30,500,000; nitrocellulose, 7,150,000 lb.; and cuprammonium, 7,650,000 lb. As of July 1, a total gross capacity of 233,400,000 lb. was distributed among the processes as follows: viscose, 77.5 per cent; acetate, 15.2 per cent; nitrocellulose, 3.5 per cent; and cuprammonium, 3.8 per cent. At the end of the year, some of the new construction undertaken during the year had actually been completed, adding another 2,250,000 lb. or thereabouts. Before the end of 1934 construction now in progress is expected to bring the total to 259,500,000 lb. of gross capacity, or at a 90 per cent operating rate to allow for denier change-over and other contingencies, to a net operating capacity of 233,500,000 lb.

World production also rose to unprecedented heights. Somewhere in the neighborhood of 600,000,000 lb. was produced, the United States leading the list, with two-and-one-half times the production of its nearest competitor, Japan; and with Italy, Great Britain and Germany following closely in that



order. In the cases of both the United States and world production, 1932 was badly eclipsed, the former by 52.2 and the latter by 17.8 per cent.

Consumption of rayon during the year appears to have been very slightly below production. Stocks equal to a three weeks' supply at the end of 1932 compare with a probable four weeks' supply at the close of 1933. This coupled with imports estimated at 1,300,000 lb. and exports in the neighborhood of 1,050,000 lb. indicate the somewhat better position in which producers now find themselves in the matter of meeting the needs of the trade.

Technical developments of the year tended again toward higher spinning speeds and showed that the trend away from pot spinning has been uninterrupted. Despite this, three new pot spinning machines were introduced, all designed for pot speeds as high as 10,000 r.p.m. and one equipped with a traverse motion five times as rapid as any previous machine. The object here is to give a cake that will better stand the subsequent treatment. A new Textolite pot has been developed, reinforced with steel wire bands under tension and intended to meet the needs of the new high-speed spinning. Caustic recovery, long practiced in Europe, is attracting continued interest in the United States and such recovery may soon be expected in plant operation.

Rayon Production and Imports, 1921-1933

	Thousands of Pounds		
	U. S. Production	U. S. Imports	World Production
1921	18,000	3,276	65,000
1922	26,000	2,088	80,000
1923	35,000	3,906	97,000
1924	38,750	1,712	141,000
1925	52,200	7,001	185,000
1926	62,575	10,127	219,000
1927	75,050	16,223	267,000
1928	97,700	12,754	345,000
1929	123,000	15,902	404,000
1930	119,000	5,810	417,000
1931	144,350	1,883	470,000
1932	131,000*	164	509,000
1933	200,000†	1,296‡	600,000†

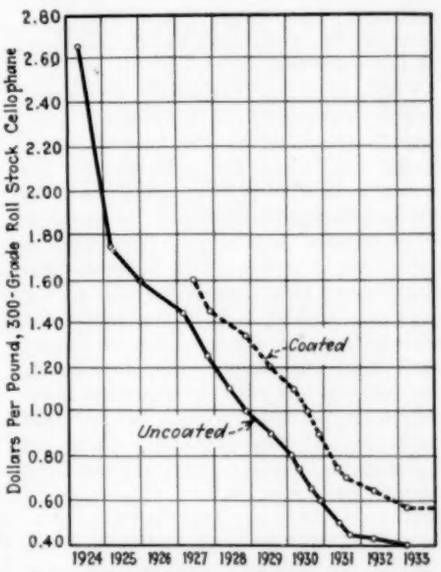
U. S. and world production figures, except as noted, are from *Textile World*.
*From *Textile Organon*.
†*Chem. & Met.* estimate.
‡Estimated on basis of imports for first ten months. Includes only yarns and filaments.

Further emphasis is being placed on low-luster yarns and on fine denier filaments. The latter have contributed materially to the truly remarkable improvement in wet and dry strength that has been made in recent years. In the last ten years, according to *Textile World*, dry strength has been increased by 30 to 50 per cent and wet strength by 80 to 90 per cent. Further than strength improvement, the use of more and finer filaments per strand of yarn has improved appearance, warmth and handle, and in large part is responsible for the excellent acceptance which the public has now accorded these products. Low luster is of course an added factor of importance in the development of this acceptance.

The anti-creasing process developed by Tootal, Broadhurst and Lee, Ltd., and described briefly in our issue of January, 1933, is now being used in at least three plants in the United States. By the formation of a synthetic resin of the urea-formaldehyde or phenol-formaldehyde type within the fiber of the fabric, the resistance to creasing of both cotton and rayon has been greatly increased. Another resin-treated fabric, Revolite, developed by Johnson & Johnson in cooperation with the Bakelite Corp., was announced within the year. The product resists oil, water and most cleaning preparations and is used for drapes, theatrical scenery and similar purposes.

As in the case of rayon, transparent cellulose and cellulose acetate wrapping film enjoyed a record year with an output in the neighborhood of 45,000,000 lb., all but about 1,500,000 lb. of which was of the former type, produced by two companies. This production compares with a figure believed to have been about 37,000,000 lb. in 1932. Coated film has continued to make large gains and now amounts to more than 50 per cent of the total. Incidentally, in this connection, DuPont Cellophane Co.'s coating patents were in the courts during the year, with the result that Sylvania Industrial Corp. is now producing its coated product under DuPont patents.

Continuous decreases in price for both the coated and the uncoated grades have contributed very largely to the enormous growth that transparent wrapping film has shown in recent years. That it has been possible to bring the uncoated grade, for example, from $2.65 per pound to $0.40 in the space of nine years is an indication that the present price has approached its base and that further great reductions are not likely. This is borne out by the accompanying chart of per-pound prices for 300-grade Cellophane, coated and uncoated, which we reproduce through the courtesy of the DuPont Cellophane Co.



Prices of DuPont's coated and uncoated 300-grade Cellophane, 1924-1933

Cigarettes continue to be the largest market, without a close competitor. For packaging products where the use of adhesives or solvents is undesirable, both DuPont and Sylvania are now offering a heat-sealing coated film. A rapidly developing market of which much is expected is the wrapping of bread which during the last year assumed enough importance to justify the efforts that have recently been made to capture it.

Competitive Conditions Ruled in Market for Solvents

CONSIDERABLE progress was made by the domestic solvents industry in the last year. In the first place, manufacturing operations in the groups which are the largest consumers of solvents was appreciably higher than had been the case in the preceding year. This had the natural effect of increasing demand for solvents and total consumption was higher accordingly.

Progress also was made in the way of developing new solvents on a commercial scale. The introduction of new solvents, however, and of old solvents by new producers served to bring out a keenly competitive condition in the market. Sales prices for different products were unsettled and in some cases contracts for large lots were put through at material concessions from quoted price levels.

This competitive situation, which was still in evidence at the close of the year, may be relieved in the present year. Many hold that the solution of this problem—and it is a problem that has vitally affected profits—will be found in the adoption by the government of a rather rigid code. The solvent producers have been discussing such a code since the middle of July and up to the present time are no closer to an agreement than they were at the first meeting. A solvents code and an ethyl alcohol code would, under the present set-up, be sub-divisions of the Chemical Alliance Code which itself has not been signed as yet. When this code is signed, a solvents code will be submitted which, if accepted by 75 per cent of the industry will automatically be forced on other producers.

Another factor which may have a bearing on the solvents industry in the future is the attempt that is being made to improve the position of lacquer manufacturers.

It is the opinion of several lacquer manufacturers as well as the automobile manufacturers that this procedure will require a considerable amount of policing which may not be compensated by the contemplated higher prices with the result that the lacquer manufacturers are pushing synthetic resins wherever they can to replace lacquers.

Any decrease in lacquer consumption would of course be immediately reflected in the solvent market. Against the spread of synthetics is the threatened shortage of glycerine which up to the present time is a balanced market with soap, unless of course the price increases considerably which will be reflected in the cost of resins. Whether some synthetic means of producing glycerine will be introduced remains to be seen.

A great deal of work is being done on newer types of lacquers, especially for paper which may more than offset the loss sustained by the introduction of resins but the demand for solvents will possibly be for the lower boiling type rather than for high boilers.

From the standpoint of litigation the high spots of last year were found in the settlement of the Commercial Solvents-Union Solvents suit in favor of the former and the subsequent dissolution of the Union Solvents Co. This suit involved the validity of the Weizmann process for the production of butyl alcohol and there are reports that suit will be entered shortly charging infringement of this patent by another manufacturing company: and in a final decision in the Glidden-DuPont suit which established the Flaherty patent covering the manufacture of Duco lacquers.

Ethyl Alcohol

Sale of ethyl alcohol came up to expectations as the industry set a quota of 110,000,000 gal. for 2 years and the sales for 1933 will probably reach 60,000,000 gal. as against 43,000,000 gal. for 1932. The consumption of ethyl alcohol in the United States is reaching normal proportions due to the fact that with the legalizing of beer and the repeal of the 18th Amendment, its illegal diversion is becoming minimized.

In the latter part of the year the quota allotted for industrial alcohol production was increased. The prospective field for pure ethyl alcohol in the beverage trade, however, was complicated by a Marketing Agreement which, although not a part of the Distillers Code, has been adopted by distillers and has received government sanction. This agreement, in substance, limits the use of alcohol in beverages to that made from domestic grains, with the exception of a 10 per cent allotment for alcohol produced from materials other than domestic grains.

The price structure of denatured ethyl alcohol has been far from satisfactory due to a great deal of jockeying on the part of producers to maintain their position. Prices were held on a fairly steady basis in the early part of the year but contracts were said to have been placed by large paint manufacturers at 3c. per gal. below the quoted level. The next break occurred around the middle of the year when one of the large oil companies in the middle west called for a tender of 1,000,000 gal. of anti-freeze alcohol, the business to be awarded on 48 hours' notice. At that time harmony among some producers had been somewhat disrupted because of disagreements over the services of some large and influential distributors. Possibly this influenced one of the alcohol producers to submit a bid which represented a decline of 3c. a gal. in the market price. This reduction was promptly met by other producers and for a short time the market was decidedly unsettled with some business placed as low as 29c. a gal. Shortly afterwards an attempt at stabilization was made but a good part of anti-freeze contracts were made during the short period of demoralization.

Among the prominent developments of the year was the acquisition of the Rossville Commercial Alcohol Co. by Commercial Solvents Corp. through a series of deals by which Commercial Solvents retained those plants which were strategic in the distributing picture, and disposed to the whisky distillers at considerable profit, those plants which were uneconomical to operate from an alcohol standpoint.

Two producers of alcohol who previously had sold their surplus outputs through distributing agencies will operate through their own sales organizations in the present year or at least will sell through different sales agencies located in consuming centers. It is expected that one of these companies, which uses a large part of its own production, will have a surplus of 6,000,000 gal. to dispose of in the open market.

Another important development of last year consisted in an announcement that the Merrimac Chemical Co., was erecting a plant at Everett, Mass., for production of ethyl alcohol from molasses. The plant is reported to have a capacity of 5,000,000 gal. of alcohol a year and it is estimated that the company will have a surplus of 1,500,000 gal. to dispose of.

Methanol

All grades of methanol were produced in larger volume last year. Data for crude and refined methanol made from wood distillation, as reported in the monthly reports, do not correspond to the totals as reported in the census returns for census years. Evidently the monthly returns are not complete as they have fallen short of the totals reported for the census years. However,

on a basis of monthly statistics, production of crude methanol for the first ten months of last year reached a total of 2,404,284 gal., compared with 1,887,701 gal. for the corresponding period of 1932. Refined methanol production for the same periods was 1,288,461 gal. and 1,212,052 gal. respectively.

Synthetic methanol opened last year with rather large stocks in the hands of producers and production was held in check in such a way that shipments exceeded the output every month of the year up to September, the totals for the first ten months of the year being 6,731,718 gal. for production and 8,817,705 gal. for shipments. Stocks at the beginning of the year were 2,467,781 gal. and at the close of October they had been reduced to 1,124,687 gal.

Sales of methanol to the anti-freeze trade apparently were not evenly distributed, as some producers did satisfactory business in that direction while others were disappointed with the volume of such business. One of the largest oil companies undoubtedly aided in the distribution of methanol, as it put out an anti-freeze product which is a combination of isopropyl alcohol and methanol, and through this the sale of methanol was increased close to 1,000,000 gal. Sales of methanol, as such, to the anti-freeze trade, also were larger than in 1932.

Improved call for bakelite resins found a counterpart in an increased outlet for formaldehyde and this was a prominent factor in widening the consuming outlet for methanol.

Butyl Alcohol and Acetate

The market for butyl alcohol and acetate like ethyl acetate, was extremely good from a volume standpoint, but the price structure was very spotty, although one large producer favored by the low price of corn and inventory piled up in 1932 when they purchased corn as low as 18 cents per bushel, undoubtedly had a very satisfactory year.

The market for butyl acetate early showed signs of unsettlement as a new producer came into the market at a time when the majority of large consumers were covered on long term contracts. This added competition was not favorable to price stability and sales were made at price concessions. Some of the contract holders apparently were influenced by the fact that material was passing at prices below their cost figures and in some cases turned to blends or to straight secondary amyl acetate, with the result that demand for secondaries showed an increase of about 20 per cent over those for 1932.

Isopropyl acetate also entered as a market favorite and because of price considerations found favor with manufacturers of lacquer and of artificial leather.

The market for higher boiling solvents was also somewhat upset due to the fact that the Ford Motor Co. is making a determined effort to use glyptol resins as a finish on motor cars and at the present time have practically all of their plants using this type of finish.

Butyl Lactate

Among the solvents for which a steadily broadening outlet was found last year special mention may be made of butyl lactate. This solvent, combining a low rate of evaporation with high solvent power, was successfully exploited for specialized uses. As a result of the introduction of butyl lactate, new types of protective coatings have been developed. This refers especially to coatings where clear or pigmented butyl lactate lacquer is sprayed on an article followed by spraying on a flock of cotton, silk, or wool which becomes firmly adhered to the coating as it dries.

In addition to its use in protective coatings, butyl lactate has made possible, the development of a new type of ink for lithographing and general printing purposes.

Acetone

The market for acetone was weak the first half of the year due to the fact that Union Solvents had stocks which they apparently desired to liquidate before final decree was given on their pending suit with Commercial Solvents.

The entrance of a new producer in the acetone and acetate field stimulated competition with the result that for a considerable period the market was unsettled with sales made as low as 8c. a lb. As the year went on due to the increase in the textile business, the demand for acetone strengthened considerably. This increase in demand combined with the fact that there was a shortage owing to the dissolution of Union Solvents and an unbalanced position of the inventory of some producers, the principal producers had difficulty making deliveries and the price increased from 8 to 10c. per lb.

Isopropyl Alcohol

Consumption of isopropyl alcohol increased considerably during 1933 owing to the natural growth of the product in specialized uses, considerable activity on the part of Carbide & Carbon Corp. in introducing isopropyl acetate and the fact that the Standard Alcohol Co. introduced isopropyl alcohol with methyl alcohol as an anti-freeze. These factors coupled with a heavy demand for acetone resulted in increasing the demand for isopropyl alcohol until nearly 5 million gallons were produced during the year.

Methyl Ethyl Ketone

During the year methyl ethyl ketone was introduced and while the volume marketed was not large, a great deal of work was done introducing this solvent and it may now be accepted as another available product in the rapidly increasing number of new solvents.

The Standard Alcohol Co. introduced methyl butyl ketone in a limited way and its reception was such that it appears to be an interesting product if

Alcohol Produced at Industrial Plants and Withdrawals for Denaturing

Fiscal Year	Alcohol Produced, Proof Gal.	Ethyl Alcohol Withdrawn for Denaturation, Proof Gal.	Denatured Alcohol Produced — Completely, Wine Gal.	Special Wine Gal.	Total, Wine Gal.
1922	79,906,101.50	59,549,919.6	16,193,523.60	17,152,224.31	33,345,747.91
1923	122,402,849.81	105,819,404.9	27,128,229.54	30,436,913.14	57,565,142.68
1924	135,897,725.83	121,576,196.1	34,602,003.72	33,085,292.04	67,687,295.76
1925	166,165,517.81	148,970,220.9	46,983,969.88	34,824,303.28	81,808,273.16
1926	202,271,670.32	191,670,107.2	65,881,442.43	39,494,443.80	105,375,886.23
1927	184,323,016.97	170,633,436.7	56,093,748.16	39,354,928.48	95,448,676.64
1928	169,149,904.83	159,689,378.2	46,966,601.28	45,451,424.28	92,418,025.56
1929	200,832,051.08	182,778,966.1	52,405,451.92	54,555,006.15	106,960,458.07
1930	191,859,342.42	181,601,420.3	58,141,740.88	47,645,796.84	105,787,537.72
1931	166,014,346.15	149,303,438.5	49,136,200.64	37,172,740.71	86,308,941.35
1932	146,950,812.76	132,578,234.7	34,298,235.54	44,031,281.80	78,329,517.34
1933	115,609,754.29	103,753,240.7	26,524,230.80	35,076,115.90	61,600,346.70

Production, Shipments and Stocks of Crude, Refined and Synthetic Methanol

1933	Crude — Production Gal.	Crude — Stocks End of Month Gal.	Refined — Production Gal.	Refined — Shipments Gal.	Refined — Stocks End of Month Gal.	Refined — Exports Gal.	Synthetic — Production Gal.	Synthetic — Shipments Gal.	Synthetic — Stocks End of Month Gal.
January	312,481	297,163	165,860	59,546	324,489	112,122	352,748	512,781	3,050,641
February	256,826	281,484	117,236	90,285	351,440	62,613	324,527	625,484	2,749,684
March	268,064	288,198	124,086	93,848	381,678	233,754	178,232	665,702	2,262,214
April	174,201	271,914	82,846	105,559	358,965	147,338	425,333	576,646	2,110,901
May	184,921	253,499	95,365	105,578	348,752	59,621	366,015	761,369	1,715,547
June	179,368	317,110	98,131	131,203	315,680	33,100	559,002	830,220	1,444,329
July	210,709	285,619	153,199	108,628	360,251	93,833	561,918	732,735	1,273,512
August	262,446	295,354	181,625	97,697	444,179	42,458	860,314	955,301	1,178,525
September	243,183	337,174	106,494	91,462	459,211	36,523	1,460,589	1,425,009	1,214,105
October	188,405	406,939	163,619	175,608	447,222	55,553	1,643,040	1,732,458	1,124,687

made available in larger quantities. Carbide & Carbon Corp. introduced several higher ketones which may be heard from in a more prominent way in the coming year.

Ethyl Acetate

Ethyl acetate was particularly good from a volume standpoint and between 3½ and 4 million gallons were consumed. The price structure, however, was very weak and in the early part of the year a relatively large amount of business was taken at 6½c. per lb. Practically 80 per cent of the business for the year was taken at 7c. with a gradual tightening of price during the last quarter which resulted in all accounts not under contract being forced to pay 7½c. However, as there were two rises in the price of acetic acid which raised the price 1c. per lb., the ethyl acetate producers had little, if any, margin of profit because of long-term contracts accepted at the low prices.

Chemical Raw Materials for the Process Industries

As an editorial supplement to its January, 1931 issue, *Chem. & Met.* issued a chart giving data on production, prices, imports and exports, manufacturing processes, grades, and uses for almost one hundred chemicals. In the present issue this data, with a list of manufacturers substituted for manufacturing processes, is brought as closely up to date as available statistics will permit. In conjunction with the insert on Modern Metals, published in September, 1932, the present supplement offers a source of ready reference to users of process and construction materials.

Wood Chemical Output Restricted Only by Charcoal Sales

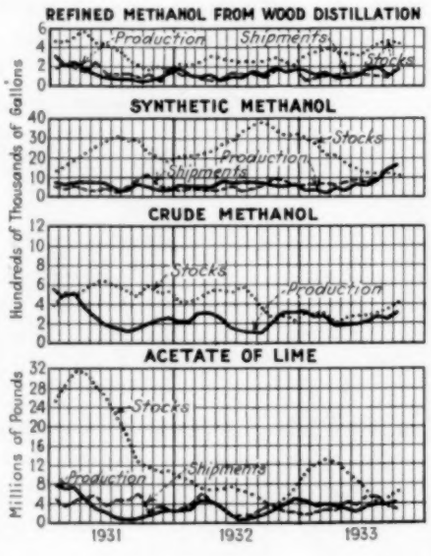
By R. S. McBRIDE

Editorial Representative, Chem. & Met.

CODE making was the principal new activity of the hardwood distillation industry in 1933. As a result, next year's operations are to be carried out under entirely new economic conditions, particularly those affecting labor. Wage rates will be much higher but price cutting in the chemical and charcoal markets is expected almost, if not wholly, to disappear. Stability is hoped for as a result of the work of the newly appointed Code Authority.

Charcoal production from hardwood in 1933 was significantly greater than in the preceding year, even slightly above the production of 1931, estimated on the basis of the first ten months' operation. Approximately 25 million bushels of hardwood charcoal were made in retort and oven plants. Prices were subject to ruinous price cutting and in many markets both producers and dealers operated without profits. In some markets competitive conditions, partly the result of pit-charcoal and pine-charcoal competition, became so bad as practically to destroy dealer organizations.

In striking contrast with the outside competition in charcoal was the stability of price for methanol and acetic acid. Price cutting in these chemicals came principally from minor hardwood distillers. This on occasion slightly disturbed markets or individual buyers but did not result in any trade disturbance at all analogous to that experienced in the charcoal division of the industry.



Shipments of methanol during 1933 by synthetic producers and by wood distillers aggregated approximately 11.8 million gallons, almost equal to the total of shipments in 1930, 50 per cent more than in 1931, and 30 per cent more than in 1932. Much of the increase in consumption came as a result of renewed industrial activity of consuming industries, but a part was the result of gradual further development of methanol as an automobile anti-freeze.

Progress toward improved marketing practice within the wood distilling group came during last year in part from the recognition of the need for improved quality in the grades of methanol offered as anti-freeze. Working under Wood Chemical Institute, a new set of specifications was prepared. (See *Chem. & Met.*, October, 1933, page 527.) During the year there was also prepared a revised edition of acetone specifications of the Federal Government. Modified Public Health Service regulations regarding labeling, coloring, and other safeguards for methanol were issued early in the year.

The trend toward the supply of a larger part of methanol from synthetic sources continued in 1933. Over 88 per cent of the shipments were synthetic methanol in contrast with 83 per cent the preceding year, 78 per cent in 1931, and approximately 60 per cent in 1930. This trend reflects more the difficulty of the wood distillers in marketing charcoal than it does any new competition on the part of synthetic manufacturers. As in preceding seasons, stocks of methanol from wood distillation were built up, both in the crude and in the refined forms; but at no time did stocks during 1933 equal the peak stocks of two years before. The same general situation as to stocks is also true in the case of acetate of lime from wood distillation. This clearly shows that the limitation of the natural source is not based upon inability to *market* the chemicals so much as it is the inability to *make* the chemicals because of failing charcoal sales.

Generally speaking, production of acetate of lime and acetic acid at wood distillation plants proceeded more uniformly during 1933 than in most preceding years. But the level of production was rather lower, again a consequence of restricted charcoal demand. Adequate supplies of synthetic acetic acid prevented price fluctuations that would otherwise have occurred in view of restricted supplies from wood distillation. Acetic acid imports during 1933 were as follows:

	Under 65 Per Cent Lb.	Over 65 Per Cent Lb.
January	.....	2,674,680
February	.....	844,080
March	.....	1,032,070
April	.....	499,640
May	.....	3,548,395
June	.....	2,282,428
July	74,560	4,830,406
August	.....	3,074,653
September	.....	4,858,071
October	.....	3,517,527
November	.....	3,428,622

1933: A Record Year For Plastics

The plastic products had a successful 1933. With only one or two exceptions production and sales were far above the preceding year. About the only dark spot on the picture was the patent situation that troubled some of the plastic manufacturers.

Cellulose Acetate

Cellulose acetate is rapidly replacing the nitrate for many purposes in this country. Not only is this true in the case of moving picture film, but also for safety glass, molded articles, and other types of products. The substitution is taking place notwithstanding the fact that the acetate is more expensive. The difference in price of the two plastics has been diminishing, but at this time there is about 10 per cent in favor of the nitrate.

The production of cellulose acetate, other than film and yarn, in 1931 was 188,000 lb., and in 1932, 653,000 lb. This rate of increase has continued through the year 1933, in which the estimated output was 2,427,000 lb. During the last year it is estimated that 30,000,000 lb. of acetate yarn, and about 1,000,000 lb. of acetate film were produced. This increased demand accounts for the decrease in price from 75c. per lb. in 1932 to 60c. per lb. at this time. The future price may be affected by the supply of acetic anhydride or the price of cotton, but unless we have inflation, it will probably remain stationary at this figure.

During the latter half of 1932, the manufacturers of safety glass began using acetate. This factor together with the increasing demand by state and city governments that automobiles be equipped with safety glass has resulted in a large increase in the demand for the molding material. It is estimated that about 1,800,000 lb. of acetate was used for the purpose in 1933. Two of the leading producers are now supplying cellulose acetate sheeting for safety glass in the form of continuous rolls. Safety glass with a resin interlayer, like the European product Luglas, is now being developed in this country, but little if any is on the market.

Acetate has gained increasing popularity in the manufacture of phonograph records. The acetate record is claimed to be unbreakable and to offer longer life than the shellac record, with freedom from noise, and a transparency that will permit covering the record with pictures or advertising matter. Records are made either entirely of acetate or with a paper base covered with a thin layer of acetate. Most of the records for electrical transcription are made of acetate. The output of this type of record is large.

Combs of acetate have been well received because of their non-flammable nature, but the volume of sales has been reduced by competition from Japanese celluloid combs.

A new application for acetate is in the manufacture of automobile regulator knobs. Cars of seven manufacturers will be equipped with them this year. Acetate is also used in many applications of thin wall molding material when shock strength is important; for example, the Shick safety razor case and the Stanley flexible rule case. Acetate wrapping material has not been the success that was expected, as static electricity continues to give trouble. The acetate producers are increasing the capacity of their plants and new firms are preparing to enter the fields.

So-called "modified acetate" have been introduced and are being used to some extent. One manufacturer is producing cellulose acetate-butyrate, and other mixed esters such as acetate-propionate are being used for special purposes.

Introduction of the injection method has simplified and lowered the cost of acetate molding, especially for small articles. Recently the duPont company has gotten control of the Buchholz patent. Under the term "transfer molding" the process is being applied by one molder to resins of the thermo-setting type. This involves a modification of the technique, in order to prevent sealing of the injection orifice by hardened compounds. It is too early to forecast to what extent this method may supplant the older methods for molding.

Vinyl Resin

In 1931, vinyl resin was first produced in commercial quantities by the Carbide and Carbon Chemical Corp. In the closing months of that year a phonograph company contracted for a considerable quantity. Since that time production of this resin has steadily increased. It is gradually replacing shellac for long-playing records. Because it is ordorless, tasteless, and unaffected by food acids, the vinyl resin is being used for making dentures. The resin is applied in thin coats on metal and other base materials for panelling. It is used in the manufacture of box toes for shoes.

Recently, the vinyl resin has been introduced into the paint and varnish industry. Two types are available: one is compatible with nitro-cellulose, is light in color, and grease- and moisture-resistant; the non-compatible type is employed for baked finishes on metal surfaces and is extremely resistant to concentrated acids and alkalis. It is available in rods, sheets, and tubes in any color and size.

The resin in any color containing 40 to 50 per cent filler, sells at 30 to 35c. per lb., depending on volume. The unfilled resin sells at 85c. to $1.25 per lb., depending on degree of transparency and volume of order.

The styrol resin industry has become more active in recent months. This resin has certain electrical properties that make it particularly applicable to high-frequency radio equipment, and the Naugatuck Chemical Co. is featuring it for that use. Recently, arrangements have been made with an outside company to sell it in the radio field, but the producer is still offering the resin in molding powder for other uses.

Urea-Formaldehyde

In 1929, the Synthetic Plastic Corp. commenced the production of urea-formaldehyde resins; two years later the Toledo Synthetic Products Co. entered the market and was followed the next year by the Unyte Corp. The patent litigation reported in these columns a year ago appears to be no nearer a settlement. Meanwhile, it has been reported that the Beetle and Pollopas interests in England have become closely associated. Recently, the Pollopas organization acquired the stock of the Synthetic Plastics Co., formerly belonging to the British Beetle company. However, the American company remains largely owned by the American Cyanamid Co.

In March, 1933, announcement was made that the Synthetic Plastics Co. had licensed the Bakelite Corp., but this company has not as yet begun the production of urea resins.

Despite the unsettled condition in regard to patent ownership, the industry has been making rapid strides. While our estimate of the production of urea resins in 1931 was 800,000 lb., and in 1932, 2,500,000 lb., it is approximately 5,000,000 lb. for 1933 or double that for the preceding year. One of the leading producers expects production to reach 8,000,000 lb. in 1934. During the past year the Synthetic Plastics Co. found it necessary to increase plant capacity 75 per cent to take care of the growing demand.

About 95 per cent of the urea resin is sold in powder form for molding. Its use for laminating continues on a small

scale because of the quiet condition existing in the construction industry. This resin holds its popularity in the china and glass industry. Large quantities are molded into tableware and sold through the five- and ten-cent stores, or distributed as premiums and gifts. One order is reported to have been for 800,000 lb. of resin, which was molded into 10,000,000 bowls to be given away as premiums by a cereal manufacturer.

Other outlets for the resin include the midget radio sets and the packaging field for cosmetic containers and closures. With the return of the alcohol beverage industry the demand for synthetic resin bottle caps has opened a new and important outlet.

The prices remained stationary during the year. The standard colors sold at 35c. per lb., the granular material in single color lots sold at 31c. per lb., and the finely ground in single color lots, at 29c.

In the molded plastics field petroleum resins developed by the Thomas and Hochwalt laboratories of Dayton have been used to a certain extent by compounding them with fillers and plasticizers, but the progress which they have made in this direction is not as great as that in the protective coating industry. They have been used for the fabrication of steering wheels, tool handles, electrical fixtures and the multitudinous classes of articles to which molding resin mixtures are now being applied.

Their production on a semi-commercial scale has only been attempted during the past three years. About 100,000 lb. have been marketed during 1932 and 1933. A large scale commercial manufacturing unit now under construction is expected to begin operation soon. These resins have been selling at 16 to 18c. per lb., but it is quite likely that they will be somewhat reduced when large scale production begins.

In 1933, the production of phenol-formaldehyde resins almost reached the all-time record made in 1929. Last year 31,000,000 lb. of the resin were produced. Excluding the cast material there was 28,800,000 lb. produced. Of this quantity 65-70 per cent was used for molding powder, and the remainder for laminating varnish and varnishes used for binders in such products as grinding wheels, carbon brushes, electric resistors and wood veneer. The industry had a particularly discouraging first four months of the year when production was 15 to 20 per cent below the preceding year. Prices remained stationary after a reduction in January, a year ago.

One of the important new outlets in this country for the phenolic resins is caps for liquor bottles. A manufacturer received an order from one concern for 800,000 lb. of phenolic resin for this purpose. The Canadian whisky distillers have used this type of closure for several years.

Another new application for the resin that has a promising future is the impregnating of fabric for adhesive tape and other purposes. The tape is being made by Johnson & Johnson through an arrangement with Bakelite.

The cast phenol resins have continued the growth started in 1930. Last year it is estimated 3,000,000 lb. were produced. About 200,000 lb. of this quantity represents water clear resin. This increase has involved expansion of plants by several manufacturers. Material of this type has encroached upon certain fields heretofore supplied by nitrocellulose and by casein plastics. About 25 per cent of the cast material was used for handles on cutlery and kitchen utensils, 35 per cent for jewelry and novelties, 20 per cent for buttons, etc., and the remainder for knobs on electrical appliances, for automobile parts, and electric clock cases.

Average prices have been slightly reduced. While the price for most colors in 1932 was 55c. per lb., it is now 47.5c. The water clear is selling at 54c. per lb.

HIGH LIGHTS OF 1933

Production of cellulose acetate, other than film and yarn, increased from 653,000 lb. in 1932 to 2,427,000 in 1933.

Injection molding adopted in the U. S.: DuPont got control of Buchholz patent.

Vinyl resins made important gains.

Urea resins production doubled that for 1932.

Phenol resins almost reached all-time record made in 1929.

Important new outlet in U. S. for plastics: A single order from whisky distiller was for 800,000 lb. of phenolic resin for bottle caps.

Cast phenols made big gain in sales.

Casein-Formaldehyde

The American casein-formaldehyde resin industry has not been as fortunate as the British industry where sales are reported to be increasing rapidly due to the abandonment of the gold standard and to the protective tariffs. During the year that has just come to a close, one of the smaller manufacturers in the United States discontinued production, but domestic sales have about held up with the figure for the previous year.

Plioform, the thermoplastic molding material made from rubber and introduced in 1932, has met with fair success. Interesting results have been obtained in the field of sound reproduction. Trials indicate that its low moisture absorption make it suitable for molded containers for liquids. It is available in a wide range of pearlescent and transparent colors. The price is 55c. per lb.

Production of Plastic Materials

DATA obtained by the Tariff Commission from domestic producers of cellulose plastics indicate that the production of pyroxylin plastics declined approximately 50 per cent from 1928 to 1932, both years inclusive, as compared to a material increase in the production of cellulose acetate plastics.

From 75 to 80 per cent of the pyroxylin plastics and at least 90 per cent of the cellulose acetate plastics are sold by producers either in the form of sheets for use in the manufacture of safety glass or in the form of other sheets, rods, and tubes. The remainder is fabricated by producers into finished or partly finished articles. Production of sheets used in safety glass manufacture declined from 12 per cent of the production of pyroxylin plastics in 1928 to 9.7 per cent in 1931, but in 1932 it represented 11.2 per cent of the production of pyroxylin plastics, and the major portion of the production of cellulose acetate plastics.

Production of cellulose plastics (exclusive of photographic film) is shown below:

Year	Pyroxylin lb.	Cellulose acetate lb.	Total lb.
1928	20,835,000	(a)	(a)
1929	20,652,000	(a)	(a)
1930	14,405,000	(a)	(a)
1931	14,501,000	188,000	14,689,000
1932	10,685,000	653,000	11,338,000

(a) Not publishable.

In contrast with the 50 per cent decrease in production of pyroxylin plastics is the 50 per cent increase in production of synthetic phenolic resins during the same period as shown in the following table:

Year	Synthetic Phenolic Resins
1928	20,411,000
1929	33,036,000
1930	30,868,000
1931	34,179,000
1932	29,032,000

Production statistics of synthetic resins not derived from coal tar (but excluding ester gum) could not be published prior to 1932 when the output increased to 1,898,000 lb. Estimates from the trade indicate that production of hardened casein plastics has decreased from about 2,500,000 lb. in 1928 to less than 2,000,000 lb. in 1932.

Other plastics, such as hard rubber and composition materials, compete with the cellulose, synthetic resin, and casein plastics in certain fields, and although production data are not available, the aggregate output is known to be large.

Pigments Again Move Forward

AFTER four of the longest years in memory with constantly diminishing production figures, patience has finally been rewarded with increases in almost every branch of industry. Pigments have furnished no exception in this respect, and as a result *Chem. & Met.'s* estimates of production for the most important pigments indicate an average gain of about 10 per cent. This is particularly gratifying in view of the fact that these figures include a record low for the first quarter.

During the year the newer pigments made further progress in the paint industry and in addition invaded new fields. Although the volume of more recently developed pigments is still comparatively small, they are stealing the show from the long established pigments. Titanium dioxide production made a new high in 1933. On the basis of the total weight of the titanium pigments, the tonnage for 1932 was about 28,500 tons. The new plant of the Southern Mineral Products Corp. in Virginia did not operate during the year, but one of the two other companies producing this pigment has prepared to meet the increasing demand by selecting a plant site on the Raritan River in New Jersey. During the year the demand for calcium base titanium pigment and to a lesser extent the barium base pigment increased.

Titanium Dioxide

Titanium dioxide is employed not only by the pigment manufacturers but also in the paper, rayon, rubber, ceramic, and glass industries. This pigment, like straight zinc sulphide and the other high zinc sulphide pigments, has been increasing in favor among the paper manufacturers because of the demand for greater opacity in the lighter weight papers. This comparatively new development started with the use of opaque pigments to save postage by bringing the opacity of lighter weight sheets up to that of the heavier paper formerly used.

The excellent reproductions of type and illustrations have indicated that the use of zinc sulphide pigments will become broader where opacity, clearness, and brightness are at a premium. The somewhat higher costs of the paper made with these pigments are often compensated for in the lower mailing costs of lighter printed matter. They are also popular for increasing the opacity of wax wrapping papers. To permit more easy reading of the printing on the outside of the package.

Titanium dioxide in car lots of a 20-ton minimum is selling at 17c. per lb., while both the calcium and barium base titanium pigments are selling at 6c. per lb. in car lots. Contracts are being made for a six-month period.

The trend towards high hiding pigments has proved beneficial to the zinc sulphide producers. The demand for zinc sulphide in 1933 was such that the New Jersey Zinc Co. built a new plant to take care of the increase.

The improvement in the paint and varnish, floor covering and textile, rubber, and other industries using lithopone and other zinc sulphide pigments was reflected in the sales of these pigments, which made a very satisfactory gain over the previous year of about 15 per cent. This is a greater percentage improvement than the production estimates indicate for any other of the major pigments. The 138,000-ton estimate of lithopone sales is an encouraging improvement, although still some distance from the peak year of 1929.

A new pigment has been developed by the Pure Calcium Products Co., a subsidiary of Diamond Alkali. It is calcium carbonate in a new form for use in paints, enamels, and lacquers.

The zinc oxide and leaded zinc oxide sales estimate for 1933 indicates an improvement of about 13 per cent over the preceding year. Much of this increase in demand was due to the larger output of automobiles, which amounted to 610,000 cars, or 40 per cent. According to the Census of Manufactures for 1929, 42 per cent of the total sales of zinc oxide reported by domestic producers was used in the production of rubber goods, of which 83 per cent was employed in the production of tires and inner tubes. More zinc oxide was made during the past year from the scrap metal than was formerly the case.

Every pigment must now stand alone; to get a car lot price, 20 tons in one delivery in 24 hr. and under one billing must be made. In the case of an order less than 20 tons of lead-free zinc oxide the premium is ¼c. per lb. As in most other commodities the contract period is 3 months for zinc oxide pigments. The current price for lead-free zinc oxide is 5.75c. per lb. in car lots. There has been a slight increase in the price of the 35 per cent leaded material from 4.90c. to 5c. per lb. in car lots.

The lead pigments did not show uniform improvement for the past year. While white lead, dry, made a gain of about 25 per cent, white lead, in oil, made only a very nominal gain; red lead, 11 per cent; and litharge registered an increase in demand of 6 per cent.

White Lead

White lead depends primarily upon the paint industry, which uses about 95 per cent of the production, and since there has been a favorable change in that industry, white lead has likewise benefited. Red lead continues to be the most important protective coating for iron and steel, and although the volume of construction has shown some improvement, it continues to lag behind most industries. The storage battery industry is the largest user of red lead, and while there has been an increase in the number of batteries sold, the depression induced the manufacturers to reduce the quantity of the red lead in the paste used in the manufacture of battery plate and substitute larger quantities of litharge and other lead compounds.

New basic prices for some of the lead pigments became effective on the first of the new year, while in nearly every case there were some changes in structure or in method of quoting prices. The new schedule: dry basic carbonate, 20-ton lots in one shipment, 6.5c. per lb.; less than 20 tons, 6.75c. per lb.; basic sulphate, 20-ton lots in one shipment, 6c. per lb.; less than 20 tons, 6.25c. per lb. Since October the price for red lead has remained unchanged at 7.75c. per lb. in casks. There has been no further change in the price of this pigment in kegs.

Pigments Sold by U. S. Manufacturers
(Short Tons)

	White Lead dry	White Lead in oil	Red Lead	Zinc Oxide	35% Leaded ZnO	Litharge	Lithopone
1927	32,669	119,026	39,073	151,246	26,064	77,311	176,994
1928	42,049	111,923	40,497	160,904	24,223	.....	200,468
1929	42,159	104,872	43,021	160,611	27,149	81,868	206,315
1930	32,548	69,592	32,941	119,142	17,279	72,578	164,065
1931	30,922	66,446	25,853	95,700	18,577	63,890	151,850
1932	19,946	46,728	18,880	72,250	14,305	58,096	121,667
1933*	25,000	47,000	21,000	82,000	16,000	61,500	138,000

*Figures for 1933 are Chem. & Met's estimates, all others are from the Dept. of Commerce.

Coal Products and Gas Industries Respond to Improvements

COAL PRODUCTS, responding as usual to coke demand from the metallurgical industry, were produced in increased quantities during 1933. Approximately 97 per cent of the coke made was manufactured in byproduct ovens. Only 3 per cent, or about 830,000 tons, was manufactured in beehive ovens. The combined output from the two divisions of the industry was nearly 28,000,000 tons, or 27 per cent more than the preceding year, but slightly less than the output in 1931.

The production of primary products at byproduct ovens in 1933 is estimated as follows:

Byproduct coke.....26,800,000 tons
Tar .....380,000,000 gal.
Ammonium sulphate or equivalent .....900,000,000 lb.
Crude light oil.....90,000,000 gal.
Gas .....440,000,000 M. cu.ft.

Coke consumption for household heating continued to increase during 1933. The total so used was about 10,000,000 tons, or roughly 40 per cent of the total country consumption. In the preceding year, though the tonnage was slightly less, the percentage was greater due to the fact that metallurgical uses of coke were in 1932 at the lowest ebb in many years. That year the household and miscellaneous industrial uses about equalled the total of blast furnace and foundry use of coke, the first time in the history of the industry that such situation ever prevailed.

During the latter half of 1933 there was a slow, but significant, decline in the stocks of byproduct coke on hand at producers' plants. At the end of the year these stocks were, for the first time in many months, a trifle under 3,000,000 tons, or equivalent only to about 40 days output at the current rate of production. It is noticeable that an increase in output and in coke demand occurred in every part of the country but, as would be expected, on the largest scale in the more active metallurgical districts near Pittsburgh, Buffalo, and Chicago. Approximately 10 per cent increase over the preceding year occurred in nonmetallurgical areas, as high as 40 to 45 per cent in some of the larger blast furnace districts.

The output of byproducts continued in the normal relation to coke and no striking changes either in market demand or in prices occurred during the year, except in the case of ammonia which is discussed elsewhere in this issue.

City gas companies in contrast with certain other divisions of industry suffered a material decrease in business during 1933. The percentage decline in gross revenue, amounting only to 5.6 per cent, does not appear large, but was the occasion of serious difficulty because of the infrequent turnover of capital in this industry. According to preliminary reports of the American Gas Association, the decline in revenue was 7.5 per cent for manufactured gas concerns but less than 3 per cent for natural gas utilities. The lesser loss in the latter group was the result of sharp increases in the use of natural gas for industrial purposes, averaging 7 per cent for the year as a whole and a much higher percentage during the last few months. The trend toward increased natural gas supply for city use continued but at a much slower rate of increase than in the several preceding years. Substitution of natural gas for manufactured gas occurred only in a few additional cities.

Industrial uses of natural gas for the manufacture of carbon black, in oil-field and refinery operation, and for like nonutility services was estimated by A.G.A. as slightly greater than in 1932, so that the total consumption of natural gas in 1933 was between 1 and 2 per cent greater than in the preceding year. The statistical department of A.G.A. furnishes the interesting resumé of the activity of the industry during 1933 and its status at the beginning of 1934.

Manufactured Gas and Natural Gas in 1932

	Manufactured Gas	% Change From 1932	Natural Gas*	% Change From 1932
Customers	9,700,000	—2.0	5,500,000	—0.5
Gas sales (M. cu.ft.)	340,000,000	—5.0	850,000,000*	+2.0
Revenue	$380,000,000	—7.5	$305,000,000*	—3.0

*Natural gas estimates do not include quantity of gas used for carbon black and field use or the value of such gas. Very approximate figures for these uses would be 700,000,000 M. cu.ft. with a value of $35,000,000.

Miles of main (transmission and distribution)		
(a)	Natural gas	160,000
(b)	Manufactured gas	95,000
(c)	Total	255,000
Total investment		
(a)	Natural gas*	$2,000,000,000
(b)	Manufactured gas	2,500,000,000
(c)	Total	4,500,000,000

* Includes $1,600,000,000 invested in natural gas mains and pipe lines.

BYPRODUCTS OBTAINED FROM COKE-OVEN OPERATIONS IN 1932[1]
(BUREAU OF MINES)

Product	Unit	Production (millions)	Quantity (millions)	Sales Value Total (thousands)	Sales Value Average
Tar	gal.	303.8	222.3	$8,931	$0.040
Ammonia:					
Sulphate	lb.	575.2	606.6	5,366	.009
Ammonia liquor (NH_3) content	lb.	34.2	34.4	1,072	.031
		.....	.....	6,438	.....
Sulphate equivalent of all forms	.....	712.2	744.4	.....	.....
Gas:					
Used under boilers, etc.	M. cu.ft.	[2]347.4	9.5	542	.057
Used in steel or affiliated plants	M. cu.ft.		64.9	7,249	.112
Distributed through city mains	M. cu.ft.		146.7	45,274	.309
Sold for industrial use	M. cu.ft.		9.7	1,812	.187
		.....	230.8	54,877	.238
Light oil and derivatives:					
Crude light oil	gal.	[3]73.7	5.6	490	.087
Benzol, crude and ref.	gal.	10.5	10.9	1,927	.176
Motor benzol	gal.	32.7	32.5	3,823	.177
Toluol, crude and ref.	gal.	8.9	8.7	2,341	.269
Solvent naphtha	gal.	2.1	1.9	348	.182
Xylol	gal.	1.5	1.4	349	.236
Other light oil prod.	gal.	2.9	1.8	126	.068
		[4]58.8	63.0	9,404	.149
Naphthalene, crude and refined	lb.	4.6	3.7	33	.009
Tar derivatives:					
Creosote oil, distillate as such	gal.	5.4	5.8	438	.075
Creosote oil in coal-tar solution	gal.	1.6	1.9	128	.064
Pitch of tar	net tons	0.04	0.001	12	8.060
Other tar derivatives	.....	.....	.....	54	.....
Phenol	gal.	0.1	0.09	19	.204
Other products[5]	.....	.....	.....	76	.....
Value of all byproducts sold	.....	.....	.....	[6]80,408	.....

[1] Includes products of tar distillation conducted by coke-oven operators under same corporate name, excepting, however, phenol, and other tar acids produced at Clairton, Pa. [2] Includes gas wasted and gas used for heating retorts. [3] Refined on the premises to make the derived products shown, 70,780,831 gal. [4] Total gallons of derived products. [5] Carbolate, crude products, cyanogen, residue, sodium prussiate, sulphur and vented vapors. [6] Exclusive of the value of breeze production, which in 1932 amounted to $4,711,340.

Western Process Industries In 1933 and 1934

By PAUL D. V. MANNING
Pacific Coast Editor, San Francisco, Calif.

FOR the most part, the process industries of the Pacific Coast deal with those manufacturing operations which utilize local raw materials. In a number of instances, these raw materials are either of such nature or so located as to give the processors advantages which offset differentials in freight to Eastern consuming markets. At the same time, this distance from the larger markets has acted in the past to prevent over-expansion. The net result is a healthy growth with less violent fluctuations in production.

Western process industries reached their lowest ebb in business during the latter part of 1932 and beginning of 1933. Most of them intensified research endeavors with a view of cutting costs and developing new methods and products. The total volume of applied research and number of research workers probably decreased during the past year, but that work pertaining to problems, the results of which could be brought into immediate action to effect changes on the cost and balance sheets, was intensified. In other words, there has been a concentration on the more objective type of research. The results have been translated into modernization and new building as well as into production of new products.

The petroleum industry increased its activities in the manufacture of solvents, bottled gas, and some heavy chemicals such as ammonium sulphate. One California oil company now controls a large insecticide manufacturing organization and is perfecting plans for modernizing which may eventually call for new plants.

Potash production increased with the major new developments taking place in the Carlsbad, New Mexico, area bringing further competition to the Searles Lake production. Western potash production has now definitely entered the ranks of one of the world's really great process industries.

As a further step towards the complete realization of the possibilities of Searles Lake brine and completion of its manufacturing program, the American Potash & Chemical Corp., having successfully completed the necessary development work, has begun the erection of a large plant designed to produce sodium sulphate and soda ash from waste salts which now pass back into the lake. Daily production which will begin during 1934 will amount to at least 100 tons of each product.

This production of high grade soda ash will more than offset that lost when one of the larger plants at Owens Lake closed several years ago. This plant, formerly owned by the Inyo Chemical Co., was purchased during the year by interests controlling the Great Western Electrochemical Co. The latter company brought into production during 1933, a plant for the manufacture of ammonium chloride and has just completed work on a new process for making hydrochloric acid. Further work now in progress promises new methods and products during 1934.

The chemical possibilities of the Pacific ocean have long been attractive to Pacific Coast industrial enterprises. In addition to salt, organic algenates, algenic acid, agar, bromine, magnesium chloride, basic magnesium carbonate, magnesium hydroxide (milk of magnesia), dried kelp, etc., are all being manufactured. Most notable in these lines during 1933 has been the progress in modernization, increase in amount of production and diversity of products, effected by the Marine Chemicals Co. at South San Francisco, Calif.

The paper and pulp industry of the Pacific Northwest has managed to carry on and the prospects are brighter than at the beginning of 1933. By putting into practice new methods and new processes, at least one large mill has been able to operate at rated capacity and even add to its capacity during the past year. Agitation resulted finally in the establishment of a well selected commission to study the problem of stream pollution by paper mill liquors and we may confidently expect some very worth while developments looking to a solution of this problem during the coming year.

With the water power developments now proposed for the entire western part of the United States, it is quite likely that there will be a great increase in interest in the establishment of electrochemical industries in the entire western section of the country and 1934 should see some very definite program started in this regard.

A number of concerns making diverse lines of products have enlarged, rebuilt, and modernized several of their plants. These include the Stauffer Chemical Co., as well as the A. R. Maas Chemical Co.

On the whole, the depression has undoubtedly been an aid to Western process industries, from one standpoint, in spite of the hardships that it has caused.

Natural Sodium Compounds And Boron Minerals

VALUE and tonnage of natural sodium compounds and boron minerals sold and used by producers in the United States during the period, 1920-1932, were published by the Bureau of Mines late in 1933. The statistics are summarized herewith.

Boron Minerals* Sold or Used by Producers In the United States During the Years, 1932-1933

Year	Short tons	Value
1920	120,320	$2,173,000
1921	50,000	1,600,000
1922	85,220	2,705,140
1923	136,650	3,994,790
1924	116,110	3,183,910
1925	113,700	3,085,660
1926	115,970	3,128,110
1927	109,080	3,473,399
1928	131,000	3,999,773
1929	169,870	4,515,375
1930	177,360	5,351,999
1931	178,550	4,931,295
1932	181,915	3,023,844

Natural Sodium Compounds Sold or Used by Producers in United States, 1920-32

Year	Carbonates[1] Short tons	Carbonates[1] Value	Sulphates[2] Short tons	Sulphates[2] Value	Borates[3] Short tons	Borates[3] Value	Total Short tons	Total Value
1920	25,392	$961,574	14,851	$221,123	2,440	$330,482	42,683	$1,513,179
1921	17,400	602,800	4,900	8,500	2,700	282,700	25,000	894,000
1922	33,537	690,021	5,015	36,155	6,854	689,598	45,406	1,415,774
1923	35,440	751,850	10,080	100,000	13,920	924,090	59,440	1,775,940
1924	44,890	835,170	16,200	174,600	15,330	816,080	76,420	1,825,850
1925	45,910	922,760	9,940	84,380	17,450	1,087,970	73,300	2,095,110
1926	56,750	1,154,840	19,620	166,800	17,110	1,005,110	93,480	2,326,750
1927	67,240	1,253,352	23,080	168,882	55,450	2,412,090	145,770	3,834,324
1928	79,830	1,578,256	6,580	42,485	119,970	3,651,487	206,380	5,272,228
1929	102,930	1,916,632	7,540	41,199	164,720	4,149,835	275,190	6,107,666
1930	90,300	1,585,756	32,630	206,323	174,510	5,105,425	297,440	6,897,504
1931	78,530	1,223,544	32,510	198,132	178,550	4,931,295	289,590	6,352,971
1932	55,377	888,052	32,204	210,342	181,915	3,023,844	269,496	4,122,238

[1] Soda ash, bicarbonate, and trona; 1923-26 and 1930 also includes sal soda.
[2] Salt cake and Glauber's salt.
[3] 1920-26, borax; 1927-30, borax and kernite; 1931-32, borax, kernite, and boric acid (calculated as borax).
*1920-26, borax and colemanite; 1927-29, borax, kernite, and colemanite; 1925 and 1927-30 also include boric acid; 1931-32, borax, kernite, and boric acid (calculated as borax).

Naval Stores Gain in Export And Domestic Trade

IMPROVEMENT in the naval stores industry last year took the form of an increase in domestic consumption, larger shipments to foreign countries, and a rise in value of products.

Receipts of gum rosin and gum turpentine at the three principal southern ports for the first ten months of 1933 showed noteworthy gains over those for the similar period of 1932. In the case of spirits of turpentine, the gain in receipts from primary points was approximately 26 per cent, with 16 per cent increase in gum rosin supplies.

Stocks at the ports at the close of October also were lower than they were in the preceding year so that increased receipts may be regarded as evidence of substantial growth in consuming demand.

Production figures are available for wood rosin and wood turpentine for the first eleven months of the year. The output reported for wood rosin in that time reached a total of 392,727 bbl. which compares with 312,724 bbl. for the eleven-month period of 1932, or an increase of more than 25 per cent. Production of wood turpentine also was speeded up more than 20 per cent, the totals being 61,524 bbl. for 1933 and 50,884 bbl. for 1932.

Export trade in naval stores, according to the latest official reports which cover ten months of 1933, place the totals at 832,717 bbl. for gum rosin, 180,087 bbl. for wood rosin, 11,276,880 gal. for gum spirits of turpentine, and 684,146 gal. for wood turpentine. Corresponding totals for 1932 were 797,178 bbl. for gum rosin, 129,053 bbl. for wood rosin, 8,993,287 gal. for gum turpentine, and 454,920 gal. for wood turpentine.

The statistical position of the naval stores industry has been steadily improving from the beginning of the 1932 naval stores year. Production in the 1932-33 season was on a restricted basis which aided in the reduction of stocks through a somewhat slow consuming year. Production for the 1933-34 season is estimated at an increase of about 400,000 bbl. of rosin and 120,000 bbl. of turpentine, but this will be offset by the broadening in domestic and foreign trade.

Prices for turpentine varied considerably during the last year, but the net change was in favor of higher levels. The New York quotation at the beginning of the year was 44c. a gal., and at the close of the year the figure was 47¾c. a gal. with the trend upward. The price recovery for rosin likewise was noted by a rising tendency at the close of the year when H grade was held at $5.05 a bbl., whereas the opening price of the year was $3.90 a bbl.

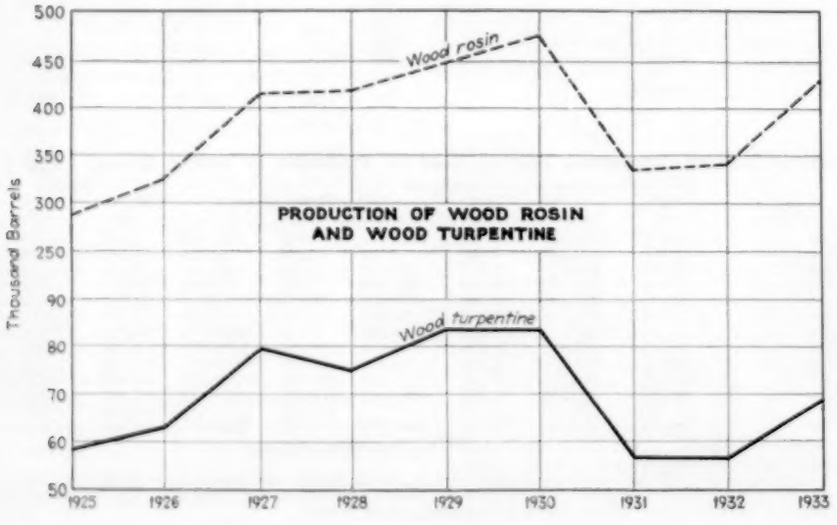
One of the most important developments of the year in the naval stores industry consisted in the drawing up of a marketing agreement which has been approved by the Secretary of Agriculture. In effect, the agreement proposes to stabilize production and incidentally to conserve supplies by tapping trees which have at least a nine-inch diameter at a point four and one-half feet from the ground; to place the industry under a committee of control; to license producers; to establish sales quotas based on individual production over the last four years.

According to a study made by J. E. Lockwood, naval store specialist, normal domestic consumption of rosin is divided as follows:

Large Consuming Industries		
Paper and fiber board	300,000	
Soap	240,000	
Paint, varnish, and lacquer	220,000	
		760,000
Medium Consuming Industries		
Rosin oil and printing ink	65,000	
Linoleum and oil cloth	40,000	
Sealing wax and insulation	35,000	
Foundries and core oil	20,000	
		160,000
Small Consuming Industries		
Chemicals and pharmaceuticals	4,100	
Matches and woodenware	3,000	
Autos and wagons	1,300	
Polishes and leather	700	
Shipyards and carshops	500	
		9,600
Miscellaneous Industrial Uses		
Batik		
Munitions		
Belt dressing		
Brewers' pitch		
Shoe compounds		
De-hairing hogs		
Rubber compounds		
Sticky fly-paper		
Plastic compounds		
Asphaltic emulsions		
Setting brush-bristles		
Talking machine records		
Flux for soldering and tin plating		
Waterproofing compounds		
Others not listed		2,400
Total Industrial		932,000
Not Accounted for		48,000
Estimated Total Consumption		980,000

Receipts of Gum Rosin and Gum Turpentine at Three Southern Ports

	Gum Rosin		Gum Turpentine	
	1933 bbl.	1932 bbl.	1933 bbl.	1932 bbl.
Jan.	35,064	28,614	6,283	5,234
Feb.	30,639	29,539	2,826	3,808
Mar.	35,796	31,705	6,710	6,190
Apr.	63,372	64,070	18,176	17,018
May	110,450	91,527	32,359	27,410
June	121,946	96,115	35,549	26,481
July	123,977	104,904	35,265	29,723
Aug.	113,107	99,148	33,237	27,770
Sept.	91,251	83,484	26,911	22,811
Oct.	90,474	75,153	24,479	19,362
	816,076	704,259	221,795	176,167



Barium Products Sales Declined in 1932

The total quantity of barium products sold or used by producers in 1932 was 177,836 short tons, a decrease of 22 per cent from 1931. The aggregate value was $12,191,374, a decrease of 26 per cent compared with 1931.

Barium chemicals, which in 1931 showed increases, in 1932 experienced marked decreases in sales. Blanc fixe registered a large loss (54 per cent in quantity and 49 per cent in value), although the unit value advanced from $58.67 per ton in 1931 to $64.55 in 1932. Barium carbonate, chemically precipitated, declined 42 per cent in quantity and 41 per cent in value, while the unit value increased from $44.52 in 1931 to $45.48 in 1932.

Consumption of Vegetable Oils Increased Last Year

BASED on statistics for the first three quarters of the year, domestic production of crude vegetable oils was slightly lower in 1933 than in 1932. Production for the nine-month period in 1933 was 1,580 million pounds compared with 1,581 million pounds in 1932. In the final quarter of last year gains were reported in the crush of corn, linseed, and coconut oils with a smaller output of cottonseed oil. The relatively poor showing for last year was due almost entirely to cottonseed oil as substantial gains were reported for production of linseed, coconut, castor, corn, and peanut oils.

The soap industry which is a large consumer of vegetable oils slowed up appreciably in the last quarter of the year and as the soap tonnage fell below that for the preceding year, consumption of oils in that direction suffered some contraction.

Paint, varnish, and lacquer manufacturers improved their position during the year so that they were about on a par with the business done in 1931. Hence there was a larger movement of paint-making oils, both as regards domestic production and importations of foreign oils.

Factory consumption of crude oils in the first nine months of last year made an excellent showing as compared with the like period of 1932. With the exception of cottonseed oil, all the oils went into consumption in a larger way, the totals being 1,980 million pounds for 1933 and 1,949 million pounds for 1932. These totals include the amounts of crude oil which went to refineries.

CONTRACTS FOR INDUSTRIAL BUILDINGS, BY INDUSTRIES

(Value in thousands of dollars)

INDUSTRY	1932	1933
Transportation Service		
1. Railroads	$1,108	$3,621
2. Automotive	9,562	10,288
Public Utilities & Other Power Plants	22,800	14,290
PROCESS INDUSTRIES	19,002	43,203
Food Industries	14,385	50,038
Metal Refining & Rolling	745	6,979
Metal Working Plants		
1. Auto Factories	3,735	331
2. Aircraft Factories	418	128
3. Foundries	188	465
4. Machines & Machined Parts	5,220	2,848
Textiles (excl. rayon)	2,047	2,781
Wood Industries	595	2,296
Miscellaneous		
1. General Factories	12,646	14,618
2. Refrigeration & Cold Storage	613	490
	$93,064	$152,376

While refining of vegetable oils went ahead at a slower rate last year, factory consumption of refined oils picked up in volume, the total reaching 998 million pounds for the first three quarters of 1933 as against 957 million pounds for the comparable period of 1932.

Low prices for pure lard had a tendency to cut down compound production and thus curtailed demand for refined oils in that field. A gain of close to 6 million pounds of lard was reported for its domestic consumption throughout the Jan.-Sept. period of 1933 whereas lard compound production in the same time fell off more than 22 million pounds.

Refiners of vegetable oils operated at a slower rate in the first nine months of the year than they did in 1932 as shown in the following:

Production of Refined Vegetable Oils

	Jan.-Sept., 1933 lb.	Jan.-Sept., 1932 lb.
Cottonseed	802,434,889	900,150,472
Peanut	7,921,966	6,657,115
Coconut	210,104,865	169,061,099
Corn	91,895,373	74,421,395
Soya	9,515,991	9,559,705
Palm Kernel	6,481,281	9,820,466
Total	1,128,354,365	1,169,670,252

Consumption of oils and fats by different industries in 1932 and 1931 offer the following comparisons:

	1932 1,000 lb.	1931 1,000 lb.
Compounds & vegetable shortening	968,577	1,208,142
Oleomargarine	166,698	190,467
Other edible products	190,065	190,835
Soap	1,375,416	1,390,230
Paint & varnish	254,251	328,390
Linoleum & oilcloth	57,515	73,473
Printing inks	10,431	13,284
Miscellaneous products	159,818	204,358
Loss including foods	172,748	172,289

Consumption of Animal Fats, Greases, etc.

	Jan.-Sept., 1933 lb.	Jan.-Sept., 1932 lb.
Cod and cod liver	6,965,126	6,989,481
Other fish	73,229,569	57,082,042
Marine animal	34,877,138	44,783,589
Total	115,071,833	108,855,112

Consumption of Fish Oils

	Jan.-Sept., 1933 lb.	Jan.-Sept., 1932 lb.
Tallow, inedible	435,586,531	454,205,895
Grease	155,004,538	154,510,612
Hydrogenated oils	322,126,933	325,547,006
Stearin, vegetable	26,435,792	20,014,072
Stearin, animal, ined.	10,139,233	9,285,692
Fatty acids	83,149,361	83,115,676
Fatty acids, dist.	21,409,040	23,904,223
Red oil	16,419,711	13,551,570
Cottonseed foots	162,748,918	145,612,736
Cottonseed foots, dist.	60,711,200	57,045,535
Other veg. oil foots	36,859,615	31,015,139
Other veg. oil foots, dist.	52,570	951,905
Acidulated soap stock	43,014,490	34,928,880
Misc. soap stock	3,694,623	1,671,362
Total	1,377,350,555	1,355,360,303

Factory Production, Consumption, and Stocks of Vegetable Oils

	Production		Consumption		Stocks 1933		Stocks 1932	
	Jan.-Sept., 1933 Lb.	Jan.-Sept., 1932 Lb.	Jan.-Sept., 1933 Lb.	Jan.-Sept., 1932 Lb.	Jan. 1 Lb.	Sept., 30 Lb.	Jan. 1 Lb.	Sept. 30 Lb.
Cottonseed, crude	878,455,029	993,337,047	880,254,492	987,953,186	143,835,031	119,580,165	126,564,368	103,099,856
Cottonseed, refined	802,434,889	900,150,472	735,961,110	727,727,051	730,492,495	622,798,885	491,035,350	503,198,511
Peanut, crude	10,866,227	8,247,643	10,370,189	8,482,007	1,305,387	1,068,046	5,046,040	1,144,874
Peanut, refined	7,921,966	6,657,115	5,734,689	4,794,329	2,109,183	1,878,704	1,530,640	1,731,232
Coconut, crude	252,495,744	193,259,792	423,118,658	392,640,676	120,928,496	132,529,537	188,351,946	145,338,966
Coconut, refined	210,104,865	169,061,099	223,400,134	185,877,363	14,227,342	16,399,887	14,796,579	13,003,572
Corn, crude	93,633,909	77,750,085	102,906,754	86,488,767	9,502,677	15,626,641	10,386,337	8,288,899
Corn, refined	91,895,373	74,421,395	19,877,202	19,070,433	12,431,224	10,985,122	12,871,030	7,837,780
Soya bean, crude	18,622,956	29,290,481	20,946,461	19,764,708	12,633,199	8,120,014	13,635,137	11,001,906
Soya bean, refined	9,515,991	9,559,705	6,962,932	9,208,574	3,739,006	2,608,727	4,714,218	5,344,972
Olive, edible	1,983,030	616,110	1,549,750	1,172,124	4,631,185	6,709,800	4,050,525	5,332,847
Olive, inedible	10,312	.....	7,979,295	4,899,510	1,453,489	3,041,845	1,376,512	1,387,196
Olive, foots	.....	.....	26,863,489	23,829,928	13,504,643	11,248,373	8,981,149	12,492,442
Palm kernel, crude	.....	.....	13,267,950	12,732,904	6,422,736	4,696,492	8,016,911	7,335,398
Palm kernel, refined	6,481,281	9,820,466	5,842,726	10,133,300	781,980	860,705	1,663,305	1,114,584
Rapeseed	.....	.....	5,724,060	4,861,797	2,451,763	1,900,401	3,866,570	2,691,034
Linseed	272,042,244	234,049,685	186,820,170	175,994,098	121,775,377	99,631,578	154,484,399	97,495,599
China wood	.....	.....	69,292,649	52,688,673	30,914,786	34,402,374	33,410,550	30,819,445
Castor	33,677,876	27,106,695	15,100,931	10,673,592	12,304,864	12,684,432	11,886,830	12,710,394
Palm	.....	.....	180,534,647	147,577,392	80,333,910	92,196,139	89,073,994	83,972,431
Sesame	9,096,614	5,167,173	12,461,568	9,122,793	3,052,365	3,318,058	10,703,864	6,022,904
Sunflower	.....	.....	9,741,358	6,101,078	3,186,840	11,281,125	338,830	1,860,400
Perilla	.....	.....	11,708,208	3,763,376	6,143,786	5,592,607	.....	6,680,351
All other	8,957,533	11,694,698	1,845,550	1,173,258	1,589,278	445,885	7,463,778	1,229,335
Totals	2,708,195,839	2,750,189,661	2,978,264,972	2,906,730,917	1,338,056,470	1,219,605,542	1,204,248,862	1,071,134,928

Increased Domestic Consumption Of Synthetic Camphor

AS THE result of an investigation of synthetic camphor, the first of three reports required by provisions of paragraph 51 of the Tariff Act of 1930, the Tariff Commission shows that the domestic production of synthetic camphor substantially exceeded 25 per cent of the total consumption of domestic and imported synthetic camphor combined, during the six months ended June 17, 1933. Therefore, on the basis of these facts, the President is not required to proclaim any change in the present rate of duty of 5c. per lb.

The report described synthetic camphor as a white, crystalline solid obtained by complex chemical processes from turpentine. Chemically and physically it is identical with the natural BB (crude) camphor except that it is optically inactive. In the United States both types are used almost entirely as plasticizers in the pyroxylin and safety glass industries, although the synthetic material is preferred for safety glass sheets because it does not tend to discolor the glass. Increased use of plasticizers, such as tricresyl phosphate, triacetin, and others; the trend to plastics not requiring camphor, such as cellulose acetate; and competition from synthetic resins in the plastics field, have materially reduced the industrial consumption of camphor in recent years.

Numerous unsuccessful attempts have been made in the United States to establish a synthetic camphor industry. The only important domestic plant was operated by E. I. du Pont de Nemours & Co. at Deepwater Point, N. J., where appreciable quantities were produced for several years. In 1922 production was stopped because costs were too high. A later attempt was made by the Belle Chemical Co. at Belleville, N. J. Small quantities were produced from time to time until 1931 when the plant was dismantled. A new commercial unit was installed by E. I. du Pont de Nemours & Co. at Deepwater Point, during the latter part of 1932, and started operation about Jan. 1, 1933. The exact figures of production by this firm during the 6-month period ended June 17, 1933, cannot be stated because to do so would reveal confidential information.

Domestic production of synthetic camphor during the period ended June 17, 1933 cannot be shown but it substantially exceeded 25 per cent of total domestic consumption.

Statistics of consumption of synthetic and natural BB (crude) camphor have been collected for the first 6 months of 1931, 1932, and 1933 as shown in the following table:

Domestic consumption of synthetic and natural BB (crude) camphor for 6 months periods, 1931, 1932, and 1933

Period	Synthetic camphor Lb.	Natural BB (crude) camphor Lb.	Proportion of synthetic to total consumption Per cent
Jan.-June, 1931	1,783,979	600,471	74.8
Jan.-June, 1932	573,174	1,222,418	31.9
Jan.-June, 1933[1]	434,437	980,815	30.7

[1]Month of June, 1933, estimated by respective consumers.

The domestic consumption of synthetic camphor during the first period of the investigation, Dec. 18, 1932—June 17, 1933, is shown below:

	Lb.
1932	
Dec. 18-31	18,635
1933	
Jan.	47,483
Feb.	44,086
March	46,708
April	85,510
May	108,090
June 1-17	46,626
Total	397,138

The shift in the consumption of camphor from the synthetic to the natural product is due principally to the fact that the largest domestic consumer of camphor in any form, a subsidiary of the sole domestic producer of synthetic camphor, was substituting the natural camphor for the synthetic product during the first half of 1932 and 1933. In this connection attention is called to the fact that largely because of the depreciation of the Japanese yen, there has been a great decline in the price of crude camphor.

Synthetic camphor: Imports for consumption, 1928-1932 and 5 months 1933

Year	Quantity Lb.	Value
1928	2,291,984	$821,652
1929	2,774,980	972,135
1930	3,524,990	1,233,715
1931	1,894,016	618,312
1932	1,422,046	394,141
1933 (5 months)	169,590	43,590

Rise in Export Sales of Carbon Black

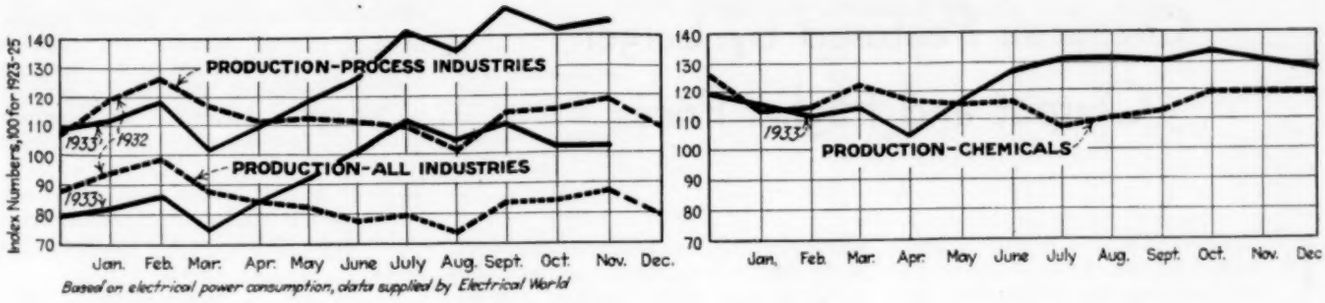
WITH the exception of 1930, there has been a rising trend to exports of carbon black and in 1932 the amount shipped out of the country exceeded 100,000,000 lb. This trend continued in 1933 and official figures place exports of carbon black at 112,893,423 lb. for the first ten months of the year and the total for the 12-month period will establish a new record for this commodity.

Figures for domestic production of carbon black in 1933 are not yet available but the largest consumers are the rubber, ink, and paint trades. All these industries increased their rate of operations during the year and a substantial gain in consumption is indicated. Production of carbon black in 1932 was 242,700,000 lb. which was lower than the 1931 total and made possible a decline in stocks.

Distribution of Carbon Black

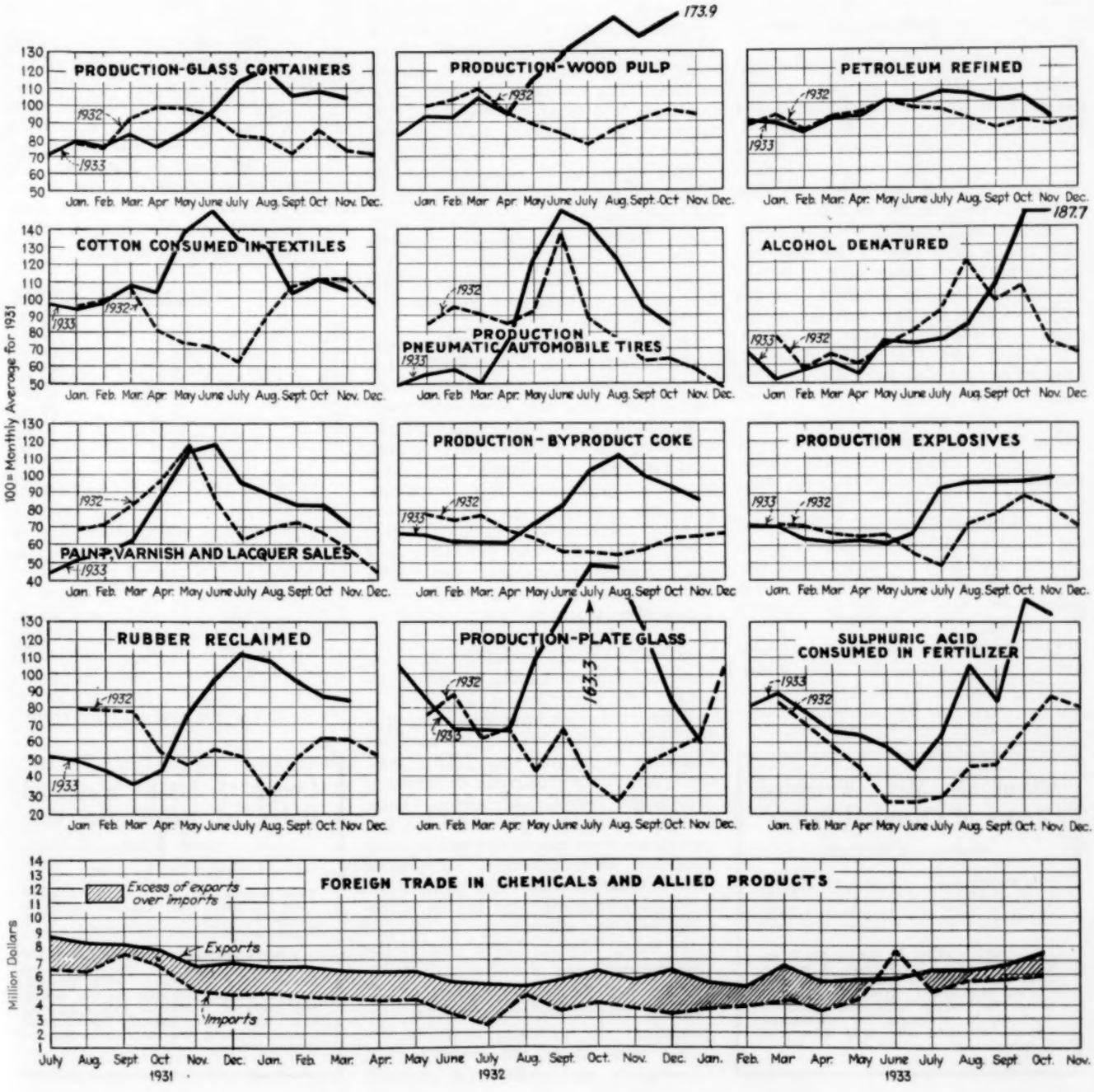
	1930 1000 lb.	1931 1000 lb.	1932 1000 lb.
Rubber	128,572	134,315	130,380
Ink	19,220	15,184	18,341
Paint	11,922	6,760	7,636
Export	84,260	96,714	100,072
Miscellaneous	7,565	5,453	5,126
	251,539	258,426	261,555

Colin G. Fink (on left) receiving Perkin Medal from Marston Bogert



Based on electrical power consumption, data supplied by Electrical World

TRENDS OF PRODUCTION AND CONSUMPTION



Chemicals Featured by Larger Output and Higher Prices

FORMULATION of a code to direct production, and to some extent distribution, was the outstanding feature in the market for chemicals last year. Codes for the different industries were the order of the day as a part of the recovery program and leading manufacturers of chemicals took an active part in writing a code for the industry. The fifth and final draft was submitted for approval late in the year, but had not been signed by the President up to the end of the year.

Pending the acceptance of individual codes, manufacturers operated under a blanket code which was intended to, and which did, increase costs of production. Increase in manufacturing costs, therefore, was one of the prominent factors in the market and one which promises to be effective for the future.

Production of chemicals started to expand in the early part of the year, but slowed up in the latter part of February and the banking situation caused a decided slump in some sections of the country throughout March and April. From May until the end of the year, productive activities were on a higher plane.

Measured in terms of *Chem. & Met.'s* index, which is based on consumption of electrical energy at chemical plants, the rate of production for the year stood at 122.34 as compared with 115.63 for 1932. All branches of the industry did not share equally in this advance, but some of the more important lines, notably alkalis and sulphuric acid, made greater progress than did the industry as a whole.

The explanation for the rise in output of chemicals may be easily understood by referring to the production totals as reported for many industries which are large consumers of chemicals. Such industries as rayon, textiles, plate glass, plastics, paint, varnish and lacquer, artificial leather, and fertilizer drew much more heavily upon chemicals than they did in the preceding year.

The outlook for production of chemicals during the first quarter of the new year was very encouraging. Consuming industries entered the year in good condition. In many cases production schedules for the first three months of 1934 are set at levels considerably higher than was reached in the first quarter of 1933. The prospects for demand for chemicals and other raw materials are, therefore, much brighter than they were a year ago.

This viewpoint is sustained by estimates of freight car loadings made by the thirteen Shippers' Regional Advisory Boards. The composite estimate is for an increase of about 6.5 per cent increase in freight car loadings for the first quarter as compared with the first quarter of 1933.

Of the twenty-nine commodities covered in the forecast, it is estimated that twenty-two will show an increase. They are: Flour, meal and other mill products; cotton; citrus fruits; potatoes; coal and coke; ore and concentrates; gravel, sand and stone; salt; lumber and forest products; petroleum and petroleum products; sugar, syrup and molasses; iron and steel; machinery and boilers; cement; brick and clay products; lime and plaster; agricultural implements and vehicles other than automobiles; automobiles, trucks and parts; fertilizers of all kinds; paper, paperboard and prepared roofing; chemicals and explosives; canned goods, including all canned food products.

Different factors have been influential in elevating the average price level for chemicals in the past year. First came the expansion in consuming demand and the natural reaction of sellers. Price cutting became less prevalent and full quotations were maintained and in some instances were advanced. Fears of money inflation also were responsible both for accelerating the buying movement and for stimulating an upward price trend. In the latter part of the year the codifying of manufacturing industries had the two-fold effect of advancing values and of checking free quotations on contracts covering delivery over all of the ensuing year. Uncertainty surrounding the probable effects of the working of the new regulations governing industry and inflation possibilities of one kind or another, not entirely dissipated, engendered caution on the part of producers, and contract quotations in many cases were restricted to the first quarter or first half of 1934, or were hedged around with conditions which would enable price adjustments to be made, should certain contingencies arise.

In the case of naval stores, industry regulations were more important as market factors than was the case for other commodities which fall under the broad chemical classification. Shipments of rosin and turpentine are to be controlled by allotment which means that sales will be under control and competition of a price-cutting character will be eliminated.

Prices for chemicals moved somewhat in conformity with the rate of production. Firmness in the early part of the period was followed by a recession in March and April, but a rising trend then set in and was still in evidence at the close of the year. The weighted price indexes of *Chem. & Met.* establish average price levels for chemicals and for vegetable oils and fats for 1923 through 1933 as follows:

	Chemicals	Vegetable Oils and Fats
1923	116.91	103.43
1924	103.88	109.31
1925	104.41	117.12
1926	104.42	112.98
1927	100.00	100.00
1928	99.51	96.43
1929	100.10	97.55
1930	95.78	86.62
1931	87.61	61.90
1932	85.00	43.60
1933	85.58	51.48

Prices for vegetable oils had declined more sharply in 1932 than those for chemicals and in consequence the reaction from the lowest levels was more pronounced. The market is still handicapped by large surpluses of such important products as cottonseed oil and animal fats, but the outlook has steadily grown favorable for higher prices. The government policy of reducing acreage planted to cotton will cut down the supply of cottonseed available for crushing

Chem. & Met. Weighted Index of Chemical Prices

Base = 100 for 1927

This month	**87.86**
Last month	87.45
January, 1933	84.54
January, 1932	85.77

Current trading in chemicals is on a higher price level than it was a year ago and the trend during last month continued upward. Higher prices for potash salts are operative due to a lowering of discounts. Nitrate of soda also was advanced in price.

Chem. & Met. Weighted Index of Prices for Oils and Fats

Base = 100 for 1927

This month	**51.38**
Last month	51.89
January, 1933	42.46
January, 1932	47.33

Price advances for oils failed to be maintained and at the close an easier tone prevailed with linseed, corn, and peanut oils selling below the level of a month ago. Animal fats also were slightly lower and contributed to the decline in the index number.

and thus automatically regulate production of cottonseed oil.

The final estimate for the flaxseed crop places yield at 6,785,000 bu. In the preceding year, production was 11,671,000 bu. and in the first 10 months of last year we imported 11,443,604 bu. of seed. Import requirements for 1934 will be higher than they were in 1933, and the Argentine is not producing to the large extent it was a few years ago. The estimate for the present Argentine crop is 53,400,000 bu.—it produced 89,055,000 bu. in the 1931-32 season—with a controlled market in prospect. Demand for linseed oil is growing and the outlook is decidedly in favor of higher prices for the coming year.

Dairy interests are interested in checking imports of vegetable oils through the imposition of tariffs. The objective includes duties upon coconut oil imported from the Philippine Islands. These attempts may not meet with success, but they add another factor to the many which are working for higher prices for vegetable oils and for animal fats.

Japan Increased Production Of Chemicals in 1933

OUTPUT of eight important chemicals in Japan during the first nine months of 1933, amounted to 1,813,680 metric tons compared with 1,608,521 metric tons during the same period of 1932. The greatest increase was in production of soda ash from 97,905 metric tons to 145,277 metric tons, reflecting the increased demands of the Japanese glass industry.

Bleaching powder production, as reported by the Bleaching Powder Manufacturers' Association of which one of the most important producing companies is not a member, was 42,705 metric tons during the first nine months of 1933, a gain of 13,606 metric tons over the same period of 1932. During the past year the members of the Association have only been producing at about 60 per cent of potential capacity. Demand for caustic soda has been heavy by the paper, rayon and pulp industries and production increased from 52,091 metric tons to 73,996 metric tons, while imports declined from 21,735 metric tons to 9,393 metric tons during the period under review.

Sulphur production increased by 36 per cent while sulphate of ammonia production showed a gain of less than 1 per cent. Despite the extensions to various sulphate of ammonia plants during the past few years, Japan has apparently not yet reached self-sufficiency in this item, as imports for the first nine months of 1933 amounted to 72,716 metric tons.

Price Range for Chemical Stocks, 1932-1933

	1932		1933			Dividend
	High	Low	High	Low	Close	Paid
Abbott Laboratories	30⅞	29	37	22⅛	37	$2.00
Agfa Ansco	14	14	6¼	3½	4½	.....
Air Reduction	63½	30⅞	112	47⅛	99	3.75
Allied Chemical	88½	42	152	70⅛	148½	6.00
American Cyanamid, B	8⅛	1⅛	16⅛	3½	16⅛	.....
American Ag. Chemical, Conn	1⅛	⅛	6¼	2	3	.....
American Ag. Chemical, Del	15½	3⅛	35	7½	25½	.....
American Com. Alcohol	27	11	89⅛	13	52⅛	.....
American Maize Products	20⅜	9	37	15½	30	2.00
American Potash & Chemical	4	4	16½	8	16½	.....
Archer Daniels	15½	7	29½	9¼	26½	1.00
Atlas Powder	25½	7	39½	9	38⅛	.....
Bon Ami, A	55	31	78	52	74½	5.00
British Celanese	2⅛	⅜	4½	1	3⅛	.....
Canadian Ind. Alcohol, A	2	1⅛	38⅛	2½	19⅛	.....
Celanese Corp	12⅛	1⅛	58⅛	4½	35⅛	.....
Certain-teed Products	3⅛	⅜	7⅛	1	3½	.....
Chickasha Cotton Oil	12½	5	34	5	18⅛	.75
Colgate-Palmolive-Peet	31½	10½	22⅛	7	10⅛	.25
Columbian Carbon	41½	13½	71½	23½	61½	2.00
Commercial Solvents	13⅛	3½	57⅛	9	31⅛	.60
Congoleum-Nairn	12⅛	6⅛	27⅛	7⅛	24⅛	1.30
Corn Products	55⅛	24⅛	90⅛	45⅛	74	3.00
Courtaulds, Ltd	6⅛	4½	11⅛	4½	11½	.14
Devoe & Raynolds, A	16⅛	7	33⅛	10	28⅛	.....
Dow Chemical	39	21½	78	30	73½	2.00
Du Pont	59⅛	22	96⅛	32½	95½	2.75
Duval Texas Sulphur	1½	⅛	8	⅛	3⅛	.....
Eagle-Picher Lead	5⅛	3	7⅛	4½	5	.....
Eastman Kodak	87⅛	35½	89⅛	46	81	3.00
Evans Wallover Lead	⅛	⅛	1⅛	⅛	3/16	.....
Freeport Texas Sulphur	28⅛	10	49⅛	16⅛	45	2.00
Glidden Co	10⅛	3½	20	3½	16	.25
Gold Dust	20⅛	8½	27⅛	12	17½	1.20
Hercules Powder	29½	13⅛	68⅛	15	61	1.50
Heyden Chemical	10	5⅛	19	8	19	1.00
Imperial Chemical Industries	2⅛	2⅛	8⅛	4⅛	8⅛	.10
Industrial Rayon	40	7⅛	85	24	80	2.75
International Ag. Chemical	3½	⅛	5⅛	⅛	2⅛	.....
Liquid Carbonic	22	9	50	10⅛	28⅛	.....
Mathieson Alkali	20⅛	9	46⅛	14	36	1.50
Monsanto Chemical	30⅛	13⅛	83	25	82	2.31
National Lead	92	45	140	43½	135⅛	5.00
New Jersey Zinc	35⅛	14½	65½	26⅛	64	2.00
Newport Industries	3⅛	1⅛	11⅛	1⅛	6⅛	.....
Pennsylvania Salt Mfg	37	32⅛	51	42⅛	51	3.00
Pratt & Lambert	19	8⅛	21⅛	11	17⅛	.50
Procter & Gamble	42⅛	19⅛	47⅛	19⅛	39	1.15
St. Joseph Lead	17⅛	4⅛	31⅛	6⅛	23⅛	.....
Sherwin-Williams	34⅛	13⅛	47⅛	12⅛	47⅛	1.00
Spencer Kellogg	11	8	22	7⅛	16	.80
Texas Gulf Sulphur	26⅛	12	45⅛	15½	40⅛	1.25
Tubize Chatillon	14	⅛	28⅛	2	11⅛	.....
Union Carbide	36⅛	15⅛	51⅛	19⅛	47⅛	1.05
United Carbon	18	6⅛	38	10⅛	38	.50
United Chemicals	2	2	6	2⅛	2⅛	.....
United Dyewood	3⅛	⅛	6⅛	⅛	3⅛	.....
U. S. Industrial Alcohol	36⅛	13⅛	94	13⅛	53	.....
Virginia-Carolina Chemical	2⅛	⅛	7⅛	⅛	3	.....
Wesson Oil	20	8⅛	37⅛	7	17⅛	.62
Westvaco Chlorine	12⅛	3	20⅛	5	15⅛	.30

What Most Recent Reports of Chemical Companies Show

	Total Resources	Current Assets	Current Liabilities	No. of Com. Shs.	Net Income
E. I. du Pont de Nemours & Co., Inc. (6/30/33)	599,139,145	125,401,107	9,285,464	10,961,479	21,529,651 9 Mos. 9/30/33 1.98 per sh. com.
Allied Chem. & Dye Corp (12/31/32)	408,536,081	150,654,699	8,029,544	2,401,288	11,441,190 Year 12/31/32 3.62 per sh. com.
Union Carbide Corp (12/31/32)	293,789,780	61,765,030	6,596,984	9,000,743	8,904,873 9 Mos. 9/30/33 0.99 per sh. com.
Eastman Kodak Co (12/31/32)	140,143,618	65,666,575	7,878,565	2,255,965	6,058,748 Year 12/31/32 2.52 per sh. com.
American Cyanamid Co (12/31/32)	46,166,389	16,457,244	2,303,427	A 65,943	349,725 B2,404,216 Year 12/31/32 0.14 per sh. com.
Hercules Powder Co (9/30/33)	42,057,747	16,151,749	803,464	606,234	1,731,015 9 Mos. 9/30/33 2.02 per sh. com.
Atlas Powder Co (9/30/33)	30,964,595	9,681,289	582,028	261,439	437,039 9 Mos. 9/30/33 0.17 per sh. com.
Monsanto Chem. Co (9/30/33)	22,328,001	7,004,818	1,607,155	429,000	1,519,704 9 Mos. 9/30/33 3.52 per sh. com.
Dow Chemical Company (5/31/33)	22,131,394	5,593,225	1,217,391	630,000	1,463,230 Year 5/31/33 1.98 per sh. com.
Mathieson Alkali Works (10/31/33)	19,575,381	3,045,259	464,271	623,283	1,024,610 10 Mos. 10/31/33 1.42 per sh. com.
Commercial Solvents (3/31/33)	9,625,580	6,496,155	231,234	2,635,684	1,279,365 9 Mos. 9/30/33 0.48 per sh. com.
Westvaco Chlor. Prod. Corp. (12/31/32)	7,788,886	1,088,162	56,837	284,962	324,789 9 Mos. 9/30/33 0.73 per sh. com.
Heyden Chemical Corp (12/31/32)	3,447,687	841,516	164,896	2,400	203,601 Year 12/31/32 1.23 per sh. com

CURRENT PRICES

The following prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to Jan. 15.

Industrial Chemicals

	Current Price	Last Month	Last Year
Acetone, drums, lb.	$0.11 -$0.11½	$0.10 -$0.10½	$0.10 -$0.11
Acid, acetic, 28%, bbl., cwt.	2.90 - 3.15	2.90 - 3.15	2.65 - 2.90
Glacial 99%, drums	10.02 -10.27	10.02 -10.27	8.89 -
U. S. P. reagent, c'bys.	10.52 -10.77	10.52 -10.77	9.64 - 9.89
Boric, bbl., lb.	.04½- .05	.04½- .05	.04½- .05
Citric, kegs, lb.	.29 - .31	.29 - .31	.29 - .31
Formic, bbl., lb.	.11 - .11½	.11 - .11½	.10 - .11
Gallic, tech., bbl., lb.	.60 - .65	.60 - .65	.50 - .55
Hydrofluoric 30% carb., lb.	.07 - .07½	.07 - .07½	.06 - .07
Lactic, 44%, tech., light, bbl., lb.	.11½- .12	.11½- .12	.11½- .12
22%, tech., light, bbl., lb.	.05½- .06	.05½- .06	.05½- .06
Muriatic, 18° tanks, cwt.	1.00 - 1.10	1.00 - 1.10	1.00 - 1.10
Nitric, 36°, carboys, lb.	.05 - .05½	.05 - .05½	.05 - .05½
Oleum, tanks, wks., ton	18.50 -20.00	18.50 -	18.50 -20.00
Oxalic, crystals, bbl., lb.	.11½- .12½	.11½- .12½	.11 - .12
Phosphoric, tech., c'bys., lb.	.09 - .10	.09 - .10	.08½- .09
Sulphuric, 60°, tanks, ton	11.00 -11.50	11.00 -11.50	11.00 -11.50
Sulphuric, 66°, tanks, ton	15.50 -	15.50 -	15.50 -
Tannic, tech., bbl., lb.	.23 - .35	.23 - .35	.23 - .35
Tartaric, powd., bbl., lb.	.25½- .26	.25½- .26	.20 - .21
Tungstic, bbl., lb.	1.40 - 1.50	1.40 - 1.50	1.40 - 1.50
Alcohol, ethyl, 190 p'f., bbl., gal.	2.415-	2.415-	2.53½-
Alcohol, Butyl, tanks, lb.	.095-	.095-	.113-
Alcohol, Amyl	-	-	-
From Pentane, tanks, lb.	.15 -	.15 -	.182-
Denatured, 190 proof			
No. 1 special dr., gal.	.346-	.346-	.34½-
No. 5, 188 proof, dr., gal.	.34 -	.34 -	.38½-
Alum, ammonia, lump, bbl., lb.	.03 - .04	.03 - .04	.03 - .04
Chrome, bbl., lb.	.04½- .05	.04½- .05	.04½- .05
Potash, lump, bbl., lb.	.03 - .04	.03 - .04	.03 - .04
Aluminum sulphate, com., bags cwt.	1.35 - 1.50	1.35 - 1.50	1.25 - 1.40
Iron free, bg., cwt.	1.90 - 2.00	1.90 - 2.00	1.90 - 2.00
Aqua ammonia, 26°, drums lb.	.02½- .03	.02½- .03	.02½- .03
tanks, lb.	.02½- .02¾	.02½- .02¾	.02½- .02¾
Ammonia, anhydrous, cyl., lb.	.15½- .16	.14 - .14½	.15½- .15½
tanks, lb.	.05 -	.05 -	.05 -
Ammonium carbonate, powd. tech., casks, lb.	.08 - .12	.08 - .12	.10 - .11
Sulphate, wks., cwt.	1.25 -	1.25 -	1.025-
Amylacetate tech., tanks, lb., gal	.14½-	.14½-	.16 -
Antimony Oxide, bbl., lb.	.08½- .10	.08½- .10	.07 - .08
Arsenic, white, powd., bbl., lb.	.04 - .04¼	.04 - .04¼	.04 - .04¼
Red, powd., kegs, lb.	.14 - .14½	.14 - .14½	.09 - .10
Barium carbonate, bbl., ton	56.50 -58.00	56.50 -58.00	56.50 -58.00
Chloride, bbl., ton	74.00 -75.00	74.00 -75.00	63.00 -65.00
Nitrate, cask, lb.	.08½- .09	.08½- .09	.07 - .07½
Blanc fixe, dry, bbl., lb.	.03½- .04	.03½- .04	.03½- .04
Bleaching powder, f.o.b., wks., drums, cwt.	1.85 - 2.00	1.85 - 2.00	1.75 - 2.00
Borax, grain, bags, ton	40.00 -45.00	40.00 -45.00	40.00 -45.00
Bromine, cs., lb.	.36 - .38	.36 - .38	.36 - .38
Calcium acetate, bags	3.00 -	3.00 -	2.50 -
Arsenate, dr., lb.	.07 - .08	.07 - .08	.05½- .06½
Carbide drums, lb.	.05 - .06	.05 - .06	.05 - .06
Chloride, fused, dr., wks., ton.	17.50 -	17.50 -	18.00 -
flake, dr., wks., ton.	19.50 -	19.50 -	21.00 -
Phosphate, bbl., lb	.07½- .08	.07½- .08	.07½- .08
Carbon bisulphide, drums, lb.	.05½- .06	.05½- .06	.05 - .06
Tetrachloride drums, lb.	.05½- .06	.05½- .06	.06½- .07
Chlorine, liquid, tanks, wks., lb.	.0185-	.0185-	.01½-
Cylinders	.05½- .06	.05½- .06	.05½- .06
Cobalt oxide, cans, lb.	1.35 - 1.40	1.35 - 1.40	1.25 - 1.35
Copperas, bgs., f.o.b. wks., ton.	14.00 -15.00	14.00 -15.00	13.00 -14.00
Copper carbonate, bbl., lb.	.08½- .16	.08½- .16	.07 - .16
Cyanide, tech., bbl., lb.	.39 - .44	.39 - .44	.39 - .44
Sulphate, bbl., cwt.	3.75 - 4.00	3.75 - 4.00	3.00 - 3.25
Cream of tartar, bbl., lb.	.18 - .18½	.18 - .18½	.15½- .16
Diethylene glycol, dr., lb.	.14 - .16	.14 - .16	.14 - .16
Epsom salt, dom., tech., bbl., cwt.	2.10 - 2.15	2.10 - 2.15	1.70 - 2.00
Imp., tech., bags, cwt.	2.00 - 2.10	2.00 - 2.10	1.15 - 1.25
Ethyl acetate, drums, lb.	.08½-	.08½-	.09½-
Formaldehyde, 40%, bbl., lb.	.06 - .07	.06 - .07	.06 - .07
Furfural, dr., contract, lb.	.10 - .17½	.10 - .17½	.10 - .17½
Fusel oil, crude, drums, gal.	.75 -	.75 -	1.10 - 1.20
Refined, dr., gal.	1.25 - 1.30	1.25 - 1.30	1.80 - 1.90
Glaubers salt, bags, cwt.	1.00 - 1.10	1.00 - 1.10	1.00 - 1.10
Glycerine, c.p., drums, extra, lb.	.11 - .11½	.11 - .11½	.10½- .10¾
Lead:			
White, basic carbonate, dry casks, lb.	.06½-	.06½-	.06½-
White, basic sulphate, sck., lb.	.06 -	.06 -	.06 -
Red, dry, sck., lb.	.07½-	.07½-	.06½-
Lead acetate, white crys., bbl., lb.	.10½- .11	.10½- .11	.10 - .11
Lead arsenate, powd., bbl., lb.	.10 - .13	.10 - .13	.09½- .14
Lime, chem., bulk, ton	8.50 -	8.50 -	8.50 -
Litharge, pwd., csk., lb.	.06½-	.06½-	.05½-
Lithophone, bags, lb.	.04½- .05	.04½- .05	.04½- .05
Magnesium carb., tech., bags, lb.	.06 - .06½	.06 - .06½	.05½- .06
Methanol, 95%, tanks, gal.	.33 -	.33 -	.33 -
97%, tanks, gal.	.34 -	.34 -	.34 -
Synthetic, tanks, gal.	.35½-	.35½-	.35½-
Nickel salt, double, bbl., lb.	.11½- .12	.12 - .12½	.11 - .11½
Orange mineral, csk., lb.	.10½-	.10½-	.09 -
Phosphorus, red, cases, lb.	.45 - .46	.45 - .46	.42 - .44
Yellow, cases, lb.	.28 - .32	.28 - .32	.28 - .32
Potassium bichromate, casks, lb.	.07½- .08½	.07½- .08½	.07½- .08
Carbonate, 80-85%, calc. csk., lb	.07 - .07½	.07 - .07½	.05 - .06
Chlorate, powd., lb.	.09 - .09½	.09 - .09½	.08 - .08½
Hydroxide (c'stic potash) dr., lb.	.07½- .07½	.07½- .07½	.06½- .06½
Muriate, 80% bgs., ton	37.15 -	37.15 -	37.15 -
Nitrate, bbl., lb.	.05½- .06	.05½- .06	.05½- .06
Permanganate, drums, lb.	.18½- .19	.17½- .18	.16 - .16½
Prussiate, yellow, casks, lb.	.18 - .19	.18 - .19	.18½- .19
Sal ammoniac, white, casks, lb.	.04½- .05	.04½- .05	.04¼- .05
Salsoda, bbl., cwt.	1.00 - 1.05	1.00 - 1.05	.90 - .95
Salt cake, bulk, ton	13.00 -15.00	13.00 -15.00	13.00 -15.00
Soda ash, light, 58%, bags, contract, cwt.	.23 -	1.23 -	1.15 -
Dense, bags, cwt.	1.25 -	1.25 -	1.17½-
Soda, caustic, 76%, solid, drums, contract, cwt.	2.60 - 3.00	2.60 - 3.00	2.50 - 2.75
Acetate, works, bbl., lb.	.04½- .05	.04½- .05	.05 - .05½
Bicarbonate, bbl., cwt.	1.85 - 2.00	1.85 - 2.00	1.85 - 2.00
Bichromate, casks, lb.	.05½- .06¾	.05½- .06¾	.04½- .05
Bisulphate, bulk, ton	14.00 -16.00	14.00 -16.00	14.00 -16.00
Bisulphite, bbl., lb.	.03 - .04	.03 - .04	.03½- .04
Chlorate, kegs, lb.	.06½- .06½	.06½- .06½	.05½- .07½
Chloride, tech., ton	12.00 -14.75	12.00 -14.75	12.00 -14.00
Cyanide, cases, dom., lb.	.15½- .16	.15½- .16	.15½- .16
Fluoride, bbl., lb.	.07½- .08	.07½- .08	.07½- .08
Hyposulphite, bbl., lb.	2.40 - 2.50	2.40 - 2.50	2.40 - 2.50
Metasilicate, bbl., cwt.	3.25 - 3.40	3.25 - 3.40	3.60 - 3.75
Nitrate, bags, cwt.	1.35 -	1.295-	1.295-
Nitrite, casks, lb.	.07½- .08	.07½- .08	.07½- .08
Phosphate, dibasic, bbl., lb.	.021- .023	.021- .023	.018- .02
Prussiate, yel. drums, lb.	.11½- .12	.11½- .12	.11½- .12
Silicate (40° dr.) wks. cwt.	.80 - .85	.80 - .85	.70 - .75
Sulphide, fused, 60-62%, dr., lb.	.02½- .03½	.02½- .03	.02½- .03
Sulphite, cyrs., bbl., lb.	.02½- .02½	.02½ .02½	.03 - .03½
Sulphur, crude at mine, bulk, ton	18.00 -	18.00 -	18.00 -
Chloride, dr., lb.	.03½- .04	.03½- .04	.03½- .04
Dioxide, cyl., lb.	.07 - .07½	.07 - .07½	.06½- .07
Flour, bag, cwt.	1.60 - 3.00	1.55 - 3.00	1.55 - 3.00
Tin Oxide, bbl. lb.	.57 -	.57 -	.27½-
Crystals, bbl., lb.	.38½-	.39 -	.24 -
Zinc chloride, gran., bbl., lb.	.05½- .06	.05½- .06	.06½- .06½
Carbonate, bbl., lb.	.09½- .11	.09½- .11	.10½- .11
Cyanide, dr., lb.	.38 - .42	.38 - .42	.38 - .42
Dust, bbl., lb.	.07 - .07½	.07 - .07½	.04½- .05
Zinc oxide, lead free, bag, lb.	.05½-	.05½-	.05½-
5% lead sulphate, bags, lb.	.05½-	.05½-	.05½-
Sulphate, bbl., cwt.	3.00 - 3.25	3.00 - 3.25	3.00 - 3.25

Oils and Fats

	Current Price	Last Month	Last Year
Castor oil, No. 3, bbl., lb.	$0.09½-$0.10	$0.09½-$0.10	$0.08½-$0.09
Chinawood oil, bbl., lb.	.08 -	.07½-	.05 -
Coconut oil, Ceylon, tanks, N. Y. lb.	.02½-	.02½-	.03 -
Corn oil crude, tanks, (f.o.b. mill), lb	.03½-	.03½-	.02½-
Cottonseed oil, crude (f.o.b. mill), tanks, lb.	.03½-	.03½-	.03 -
Linseed oil, raw car lots, bbl., lb.	.093-	.095-	.074-
Palm, Lagos, casks, lb.	.03½-	.04 -	.03 -
Palm Kernel, bbl., lb.	.04½-	.04½-	.04½-
Peanut oil, crude, tanks (mill), lb	.03½-	.03½-	.03 -
Rapeseed oil, refined, bbl., gal.	.42 - .43	.42 - .43	.31 - .32
Soya bean, tank, lb.	.06 -	.061-	-
Sulphur (olive foots), bbl., lb.	.06½-	.06½-	.04½-
Cod, Newfoundland, bbl., gal.	.34 - .35	.34 - .35	.22 - .24
Menhaden, light pressed, bbl., lb.	.053-	.053-	.03½-
Crude, tanks (f.o.b. factory), gal.	.15 -	.17 -	.10 -
Grease, yellow, loose, lb.	.02½-	.02½-	.02½-
Oleo stearine, lb.	.05 -	.05½-	.03½-
Red oil, distilled, d.p. bbl., lb.	.06½-	.06½-	.06½-
Tallow, extra, loose, lb.	.03 -	.03½-	.02½-

Coal-Tar Products

	Current Price	Last Month	Last Year
Alpha-naphthol, crude, bbl., lb.	$0.60 -$0.65	$0.60 -$0.65	$0.60 -$0.62
Refined, bbl., lb.	.80 - .85	.80 - .85	.80 - .85
Alpha-naphthylamine, bbl., lb.	.32 - .34	.32 - .34	.32 - .34
Aniline oil, drums, extra, lb.	.14½- .15	.14½- .15	.14½- .15
Aniline salts, bbl., lb.	.24 - .25	.24 - .25	.24 - .52
Benzaldehyde, U.S.P., dr., lb.	1.10 - 1.25	1.10 - 1.25	1.10 - 1.25
Benzidine base, bbl., lb.	.65 - .67	.65 - .67	.65 - .67
Benzoic acid, U.S.P., kgs, lb.	.48 - .52	.48 - .52	.48 - .52
Benzyl chloride, tech., dr., lb.	.30 - .35	.30 - .35	.30 - .35
Benzol, 90%, tanks, works, gal.	.20½- .21	.22 - .23	.20 - .21
Beta-naphthol, tech., drums, lb.	.22 - .24	.22 - .24	.22 - .24
Cresol, U. S. P., dr., lb.	.11 - .11½	.11 - .11½	.10½- .11
Cresylic acid, 97%, dr., wks., gal.	.50 - .51	.50 - .51	.49 - .52
Diethylaniline, dr., lb.	.55 - .58	.55 - .58	.55 - .58
Dinitrophenol, bbl., lb.	.29 - .30	.29 - .30	.29 - .30
Dinitrotoluen, bbl. lb.	.16 - .17	.16 - .17	.16 - .17
Dip oil 25% dr., gal.	.23 - .25	.23 - .25	.23 - .25
Diphenylamine, bbl., lb.	.38 - .40	.38 - .40	.38 - .40
H-acid, bbl., lb.	.65 - .70	.65 - .70	.65 - .70
Naphthalene, flake, bbl., lb.	.06 - .07	.06 - .07	.04½- .05
Nitrobenzene, dr., lb.	.08½- .09	.08½- .09	.08½- .10
Para-nitraniline, bbl., lb.	.51 - .55	.51 - .55	.51 - .55
Phenol, U.S.P., drums, lb.	.14½- .15	.14½- .15	.14½- .15
Picric acid, bbl., lb.	.30 - .40	.30 - .40	.30 - .40
Pyridine, dr., gal.	1.10 - 1.15	1.10 - 1.15	1.50 - 1.80
R-salt, bbl., lb.	.40 - .44	.40 - .44	.40 - .44
Resorcinal, tech., kegs, lb.	.65 - .70	.65 - .70	.65 - .70
Salicylic acid, tech., bbl., lb.	.40 - .42	.40 - .42	.40 - .42
Solvent naphtha, w.w., tanks, gal.	.26 -.....	.26 -.....	.26 -.....
Tolidine, bbl., lb.	.88 - .90	.88 - .90	.86 - .88
Toluene, tanks, works, gal.	.30 -.....	.30 -.....	.30 -.....
Xylene, com., tanks, gal.	.26 -.....	.26 -.....	.26 -.....

Miscellaneous

	Current Price	Last Month	Last Year
Barytes, grd., white, bbl., ton.	$22.00-$25.00	$22.00-$25.00	$22.00-$25.00
Casein, tech., bbl., lb.	.12½- .13	.12½- .13	.07 - .10½
China clay, dom., f.o.b. mine, ton	8.00 -20.00	8.00 -20.00	8.00 -20.00
Dry colors:			
Carbon gas, black (wks.), lb.	.04 - .20	.04 - .20	.02½- .20
Prussian blue, bbl., lb.	.35 - .37	.35 - .36	.35 - .36
Ultramine blue, bbl., lb.	.06 - .32	.06 - .32	.06 - .32
Chrome green, bbl., lb.	.26 - .27	.26 - .27	.27 - .30
Carmine red, tins, lb.	4.00 - 4.40	3.65 - 3.75	3.90 - 4.50
Para toner, lb.	.80 - .85	.80 - .85	.75 - .80
Vermilion, English, bbl., lb.	1.40 - 1.45	1.40 - 1.45	1.10 - 1.30
Chrome yellow, C. P., bbl., lb.	.15 - .16	.15 - .15½	.16 - .16½
Feldspar, No. 1 (f.o.b. N.C.), ton	6.50 - 7.50	6.50 - 7.50	6.50 - 7.50
Graphite, Ceylon, lump, bbl., lb.	.07 - .08½	.07 - .08½	.07 - .08½
Gum copal Congo, bags, lb.	.09 - .10	.08 - .09	.06 - .08
Manila, bags, lb.	.09 - .10	.09 - .10	.16 - .17
Damar, Batavia, cases, lb.	.15½- .16	.15 - .15½	.16 - .16½
Kauri No. 1 cases, lb.	.20 - .25	.20 - .25	.45 - .48
Kieselguhr (f.o.b. N.Y.), ton.	50.00 -55.00	50.00 -55.00	50.00 -55.00
Magnesite, calc, ton.	50.00 -.....	50.00 -.....	40.00 -.....
Pumice stone, lump, bbl., lb.	.05 - .07	.05 - .08	.05 - .07
Imported, casks, lb.	.03 - .40	.03 - .40	.03 - .35
Rosin, H., bbl.	5.35 -.....	4.90 -.....	3.90 -.....
Turpentine, gal.	.51 -.....	.46½-.....	.44 -.....
Shellac, orange, fine, bags, lb.	.26 - .27	.22 - .23	.20 - .25
Bleached, bonedry, bags, lb.	.29 - .31	.24 - .25	.18 - .19
T. N. bags, lb.	.21 - .22	.15 - .15½	.09½- .10
Soapstone (f.o.b. Vt.), bags, ton	10.00 -12.00	10.00 -12.00	10.00 -12.00
Talc, 200 mesh (f.o.b. Vt.), ton.	8.00 - 8.50	8.00 - 8.50	8.00 - 8.50
300 mesh (f.o.b Ga.), ton.	7.50 -10.00	7.50 -10.00	7.50 -11.00
225 mesh (f.o.b. N. Y.), ton.	13.75 -.....	13.75 -.....	13.75 -.....
Wax, Bayberry, bbl., lb.	.25 - .30	.25 - .30	.16 - .20
Beeswax, ref., light, lb.	.22 - .27	.22 - .27	.20 - .30
Candelilla, bags, lb.	.11 - .12	.11 - .12	.11 -.....
Carnuba, No. 1, bags, lb.	.31 - .32	.31 - .32	.22 - .24
Paraffine, crude			
105-110 m.p., lb.	.04 -.....	.04 -.....	.03½- .03¾

Price Changes During Month

Advanced	Declined
Acetone	Tin crystals
Ammonia, anhydrous	Corn oil
Potassium permanganate	Palm oil
Sodium nitrate	Tallow
Shellac	Linseed oil
Turpentine	Lead
Chinawood oil	Tin
Tungsten powder	

Ferro-Alloys

	Current Price	Last Month	Last Year
Ferrotitanium, 15-18%, ton.	$200.00-.....	$200.00-.....	$200.00 -....
Ferromanganese, 78-82%, ton.	85.00-.....	82.00-.....	68.00 -....
Ferrochrome, 65-70%.	.09½-.....	.09½-.....	.09½-....
Spiegeleisen, 19-21% ton.	27.00-.....	27.00-.....	25.00 -....
Ferrosilicon, 14-17%, ton.	31.00-.....	31.00-.....	31.00 -....
Ferrotungsten, 70-80%, lb.	1.15- 1.25	1.15- 1.25	.94 -1.00
Ferrovanadium, 30-40%, lb.	2.60- 2.80	2.60- 2.80	2.60 -2.80

Non-Ferrous Metals

	Current Price	Last Month	Last Year
Copper, electrolytic, lb.	$0.08 -.....	$0.08 -.....	$0.05 -.....
Aluminum, 96-99%, lb.	.229-.....	.229-.....	.229-.....
Antimony, Chin. and Jap., lb.	.07½-.....	.07¼-.....	.05½-.....
Nickel, 99%, lb.	.35 -.....	.35 -.....	.35 -.....
Monel metal blocks, lb.	.28 -.....	.28 -.....	.28 -.....
Tin, 5-ton lots, Straits, lb.	.52 -.....	.52½-.....	.23 -.....
Lead, New York, spot, lb.	.04 -.....	.0415-.....	.03 -.....
Zinc, New York, spot, lb.	.046-.....	.0487-.....	.0342-.....
Silver, commercial, oz.	.44 -.....	.43½-.....	.25¾-.....
Cadmium, lb.	.55 -.....	.55 -.....	.55 -.....
Bismuth, ton lots, lb.	1.30 -.....	1.20 -.....	.85 -.....
Cobalt, lb.	2.50 -.....	2.50 -.....	2.50 -.....
Magnesium, ingots, 99%, lb.	.32 -.....	.32 -.....	.30 -.....
Platinum, ref., oz.	38.00 -.....	37.00 -.....	28.00 -.....
Palladium, ref., oz.	21.00 -.....	21.00 -	17.00 - 18.00
Mercury, flask, 75 lb.	66.00 -.....	66.00 -.....	48.00 -.....
Tungsten powder, lb.	1.60 -.....	1.25 -.....	1.45 -.....

Ores and Semi-finished Products

	Current Price	Last Month	Last Year
Bauxite, crushed, wks., ton.	$6.50 -$8.25	$6.50 -$8.25	$6.50 -$8.25
Chrome ore, c.i.f. ports, ton.	16.00 -20.00	16.00 -20.00	16.50 -19.50
Coke, fdry., f.o.b. ovens, ton.	4.25 -.....	4.25 -.....	3.25 - 3.75
Fluorspar, gravel, f.o.b. Il., ton.	17.25 -20.00	17.25 -20.00	17.25 -20.00
Manganese ore, 50% Mn., c.i.f. Atlantic Ports, unit.	.20 -.....	.20 - ...	.19 -.....
Molybdenite, 85% MoS_2 per lb MoS_2, N. Y., lb.	.45 -.....	.45 -.....	.45 -.....
Monazite, 6% of ThO_2, ton..	60.00 -.....	60.00 -.....	60.00 -.....
Pyrites, Span. fines, c.i.f., unit.	.13 -.....	.13 -.....	.13 -.....
Rutile, 94-96% TiO_2, lb.	.10 - .11	.10 - .11	.10 - .11
Tungsten, scheelite, 60% WO_3 and over, unit.	14.00 -.....	14.00 -.....	8.00 -10.00

INDUSTRIAL NOTES

Oliver United Filters, Inc., New York, has added to its sales organization, F. W. Young, formerly with Filtration Engineers, Inc., and more recently with the Pulp Filter Co.

Croll-Reynolds Co., Inc., New York, announces that arrangements have been completed for F. M. deBeers, former president of Swenson Evaporator Co., to handle its chemical engineering equipment in the middlewest. Mr. deBeers will retain his headquarters at 20 North Wacker Drive, Chicago, Ill., and will also continue to represent Leader Industries, Inc.

E. I. du Pont de Nemours & Co., Inc., Wilmington, announces the purchase of the metal degreasing business of the Carrier Engineering Corp., Newark, N. J. This business formerly was conducted by the Carrier Metal Cleaning Division. The transaction involves the sale of patents, trademarks and good will of the Carrier vapor degreaser machine and of the solvent, Cecolene, used in connection therewith.

The Bristol Co., Waterbury, Conn., announces that a separate company, The Bristol Co. of Canada, Ltd., has been incorporated. Factory and general headquarters will be located at 64 Princess St., Toronto, Ont., where Bristol recording, indicating and control instruments will be made. J. S. Mayberry, graduate engineer of Toronto University, and for 10 years with the parent company, has been appointed manager.

Plant Rubber & Asbestos Works has moved its office and warehouse in Los Angeles, Calif., to larger quarters at 2120 East 25th Street.

Jas. P. Marsh Corp., Chicago, has appointed Richmond Seabury, 1 Orchard St., Wellesley Hills, Mass., as sales representative in New England.

National Oil Products Co., Harrison, N. J., placed J. H. Barton, vice-president of the company, as general manager in charge of production and G. D. Davis, secretary of the company, as general sales manager.

Rex Research Corp., established by F. O. Noburg, has bought manufacturing and distributing rights to Flytox and kindred products, the Flytox plant in Toledo, Ohio, and control of the Canadian branch of the business, from the receiver for Rex Research, Inc.

NEW CONSTRUCTION

Where Plants Are Being Built in Process Industries

	Current Projects: Proposed Work and Bids	Current Projects: Contracts Awarded
New England	$150,000	$28,000
Middle Atlantic	150,000	202,000
Southern	480,000	250,000
Middle West	1,148,000	650,000
West of Mississippi	1,111,000	1,340,000
Far West	450,000	34,000
Canada	158,000	.....
Total	$3,647,000	$2,504,000

PROPOSED WORK BIDS ASKED

Bakelite Plant — Bakelite Corp., 247 Park Ave., New York, N. Y., contemplates the construction of an addition to its plant at Birmingham, England. L. M. Rossi in charge. Estimated cost $200,000.

Chemical Plant—Yocum Faust Chemical Co., St. George St., London, Ont., is having plans prepared by Watt & Blackwell, Archts., 286 Dundas St., London, for a 2 story, brick addition to its plant to be equipped with special laboratory equipment and equipment for manufacturing textile chemicals. Estimated cost $30,000.

Chemistry Building—University of Arkansas, Fayetteville, Ark., plans the construction of a 1 story Chemistry Building. Estimated cost $580,000. Wittenberg & Delonoy, Southern Bldg., Little Rock, Ark., are architects.

Chemistry Building—Washington State College, Pullman, Wash., is having plans prepared by Whitehouse & Price, Archts., 628 Hutton Bldg., Spokane, for a 4 story, 81x132 ft. Chemistry Building to cost $235,000; by Rigg & Vantyne, archts., Peyton Bldg., Spokane, for a 4 story, 100x200 ft. Science Building to cost $285,000.

Cyanide Mill—Dentonio Mines, Ltd., 313 Lancaster Bldg., Calgary, Alta., plans to equip a 100 ton ball and cyanide mill at Greenwood, B. C. Plans are being prepared by A. Davis, superintendent and consulting engineer for company.

Distillery—Corporation, c/o H. Kohner, 9431 McQuade St., Detroit, Mich., contemplates the construction of a distillery. Estimated cost $100,000.

Distillery—Corporation, c/o S. Weiss, City Bank Bldg., Youngstown, O., contemplates the construction of a distillery. Estimated cost $300,000.

Distillery—Great Lakes Distilleries Co., F. H. Eggers, Genl. Mgr., Guarantee Title Bldg., Cleveland, Ohio, is having plans prepared by J. H. Graham and H. J. Hassler, Archts., Hanna Bldg., Cleveland, for converting two of its buildings into distillery, grain elevator and grain storage buildings. Estimated cost $200,000.

Distillery—Great Southern Distilling Co., 427 Carondelet St., New Orleans, La., plans to alter building at Chartres and Piety Sts., into modern distillery, and construct warehouse and grain house.

Distillery—Mairs Bottling Co., 140 Cedar St., New York, N. Y., contemplates the construction of a distillery at Long Island City, N. Y. Estimated cost $50,000.

Distillery—National Distillers Corp., Muskegon, Mich., contemplates the construction of a byproducts plant. Estimated cost $250,000.

Distillery — Henry Sullivan and Benjamin Porter, Quincy, Ill., contemplate the construction of a distillery. Estimated cost to exceed $100,000.

Dry Kiln—Vulcan Last Corp., Antigo, Wis., contemplates the construction of a dry kiln. Estimated cost $40,000.

Fertilizer Plant—Jackson Fertilizer Mfg. Co., A. A. Greene, Jr., in charge, Jackson, Miss., plans to rebuild its plant on Asylum Rd., recently destroyed by fire. Estimated cost $150,000.

Flotation Mill—Arizona Magma Mining Co., Chloride, Ariz., plans the construction of a 65 ton flotation mill. C. T. Carpenter, Heard Bldg., Phoenix, is president and general manager.

Gas Plant—City, c/o Mayor, Fulton, Mo., plans the construction of a gas plant and distribution lines. Russell & Axon, 4903 Delmar Blvd., St. Louis, Mo., are engineers. Estimated cost $85,720.

Gas Processing Plant—Garland Clymore, et al., Corpus Christi, Tex., is having plans prepared for the construction of a natural gas processing plant near Corpus Christi to process 45,000,000 ft. daily from Agua Dulce fields. Estimated cost $250,000.

Glass Factory—Hocking Glass Co., Lancaster, Ohio, plans to construct a new 3 story factory. Estimated cost $100,000.

Glue Factory—New England Chemical Industries, Inc., subsidiary of Consolidated Chemical Industries, 500 5th Ave., New York, N. Y., contemplates the construction of a 2 story, 120x540 ft. glue manufacturing plant on New Boston St., Woburn, Mass. Estimated cost $150,000.

Lacquer Plant—Glidden Co., Berea and Madison Sts., Cleveland, Ohio, and 209 11th St., Long Island City, N. Y., plans to repair its plant at Cleveland, Ohio, recently damaged by fire. Estimated cost $30,000, including equipment.

Refinery—Atlantic Refining Co., Philadelphia, Pa., and 291 Broadway, New York, N. Y., plans to repair refinery and storage house recently damaged by fire, including the construction of a new still house, at Point Breeze (vicinity of Philadelphia), Pa. Estimated cost $100,000.

Laboratories—Clemson College, Clemson College, S. C., contemplates the construction of a textile arts building, including laboratories. Estimated cost $280,000.

Oil Refinery—E. Donald Marr, 21 37th Pl., Long Beach, Calif., plans to construct an oil refinery at 233rd St. and Avalon Blvd. Estimated cost $200,000.

Smelter—Ventures, Ltd., 100 Adelaide St., W., Toronto, Ont., Can., will soon receive bids for the construction of a smelter to treat ore at Doucet, Quebec.

Gas Plant—City, Las Cruces, N. M., plans the construction of a municipal gas plant. Estimated cost $195,000.

Gasoline Plant—Community Natural Gas Co., Inc., Mt. Pleasant, Mich., plans the construction of a gasoline manufacturing plant. James P. McCloskey, c/o Company, is engineer.

Sugar Factory Equipment — American Beet Sugar Co., Steel Bldg., Denver, Colo., contemplates installing new and additional sugar refining equipment in its factories at Rocky Ford and Los Animas, Colo.

Sugar Factory — Southern Alberta Beet Growers Assn., Lethbridge, Alta., and Amalgamated Sugar Co., subsidiary of American Beet Sugar Co., Steel Bldg., Denver, Colo., plans the construction of a beet sugar factory at Lethbridge, Alta. Project is dependent upon subsidy or aid from Province of Alberta.

CONTRACTS AWARDED

Distillery—Old Jordan-Old 76 Distillery, R. L. Crigler, pres., Covington, Ky., plans to construct a distillery. Estimated cost $250,000. Separate contracts are now being awarded for construction and equipment.

Distillery—Owings Mills Distilling Co., Owings Mills, Md., awarded contract for a 4 story, 36x52 ft. distillery and alterations to two other buildings, to B. H. Maas Co., 119 Enjor St., Baltimore, Md.

Distillery—Penrose Distilleries, Inc., Penrose, Colo., plans the construction of a distillery. Estimated cost $300,000. Work will be done by day labor.

Distillery—J. E. Pepper Distillery, Lexington, Ky., awarded contract for distillery to Frank Messer & Sons, 2513 Burnett Ave., Cincinnati, Ohio. Estimated cost $400,000.

Gasoline Recovery Plant—Crown Central Petroleum Corp., Dunkirk, N. Y., awarded contract for construction of pressure distillate fractioning unit and gasoline recovery plant, to Alco Products, Inc., Dunkirk. Project includes five towers, 14 tanks and accumulators and 24 exchangers.

Paraffine Factory—Paraffine Cos., Inc., Emeryville, Calif., awarded contract for addition to factory to Barrett & Hilp, 918 Harrison St., San Francisco. Estimated cost $34,000.

Yeast Plant — Oakland, Calif. — Standard Brands, Inc., 245 11th St., San Francisco, Calif., and 595 Madison Ave., New York, N. Y., awarded contract for the construction of a yeast plant at Oakland, Calif., to Barrett & Hilp, 918 Harrison Ave., San Francisco, Calif. Estimated cost $1,000,000.

Factory—Fiberoid Corp., Indian Orchard, Mass., awarded contract for 2 story, 40x62 ft. manufacturing building, to Ernest F. Carlson, Inc., 1694 Main St., Springfield, Mass.

Laboratory—U. S. Department of Agriculture, Washington, D. C., awarded contract for 2 story, 35x56 ft. laboratory at Beltsville, Md., to Temple Construction Corp., 11 West 42nd St., New York, N. Y. Estimated cost $32,000.

Glass Factory—Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo, O., awarded contract for 144x348 ft. brick and steel warehouse at its plant at Rossford, Ohio, to Z. Bentley & Sons Co., 201 Belmont St., Toledo, Ohio. Estimated cost $250,000.

Paint Factory—American Zirconium Co., Glidden Paint Co., Pennsylvania R.R. and St. Helena Ave., Baltimore, Md., awarded contract for 108x130 ft. and 116x245 ft. manufacturing buildings, tanks, and boiler house, to Price Construction Co., Maryland Trust Bldg., Baltimore. Estimated cost $70,000.

Mining Development—"Hg" Mercury Mining Co., c/o T. Davis, Amity, Ark., contemplates a mercury mining development (cinnabar ore in Clark and Pike Counties. Owners will purchase materials and do work by day labor. Estimated cost $40,000.